

PC MAGAZINE

17-Inch Monitors

We Test 49 Ways to Widen
Your Viewing Horizons



NETWORK EDITION

Affordable ATM

PC Labs Reviews 5
ATM25 Adapters for
Desktop Applications

Michael J. Miller

Microsoft Charts
A New Direction
With Office 97

51 Inexpensive Ways to

Talk Share

On the
Internet

See

Mail

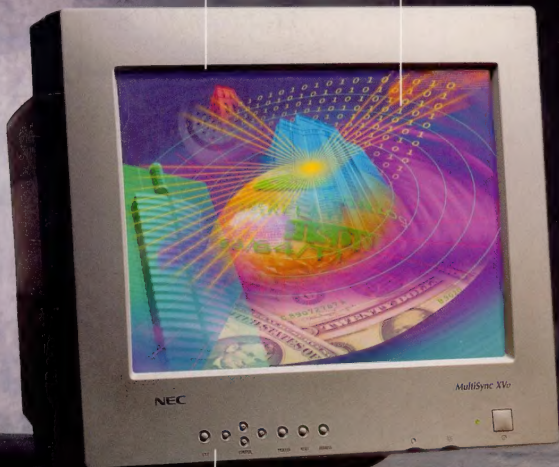


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Windows*

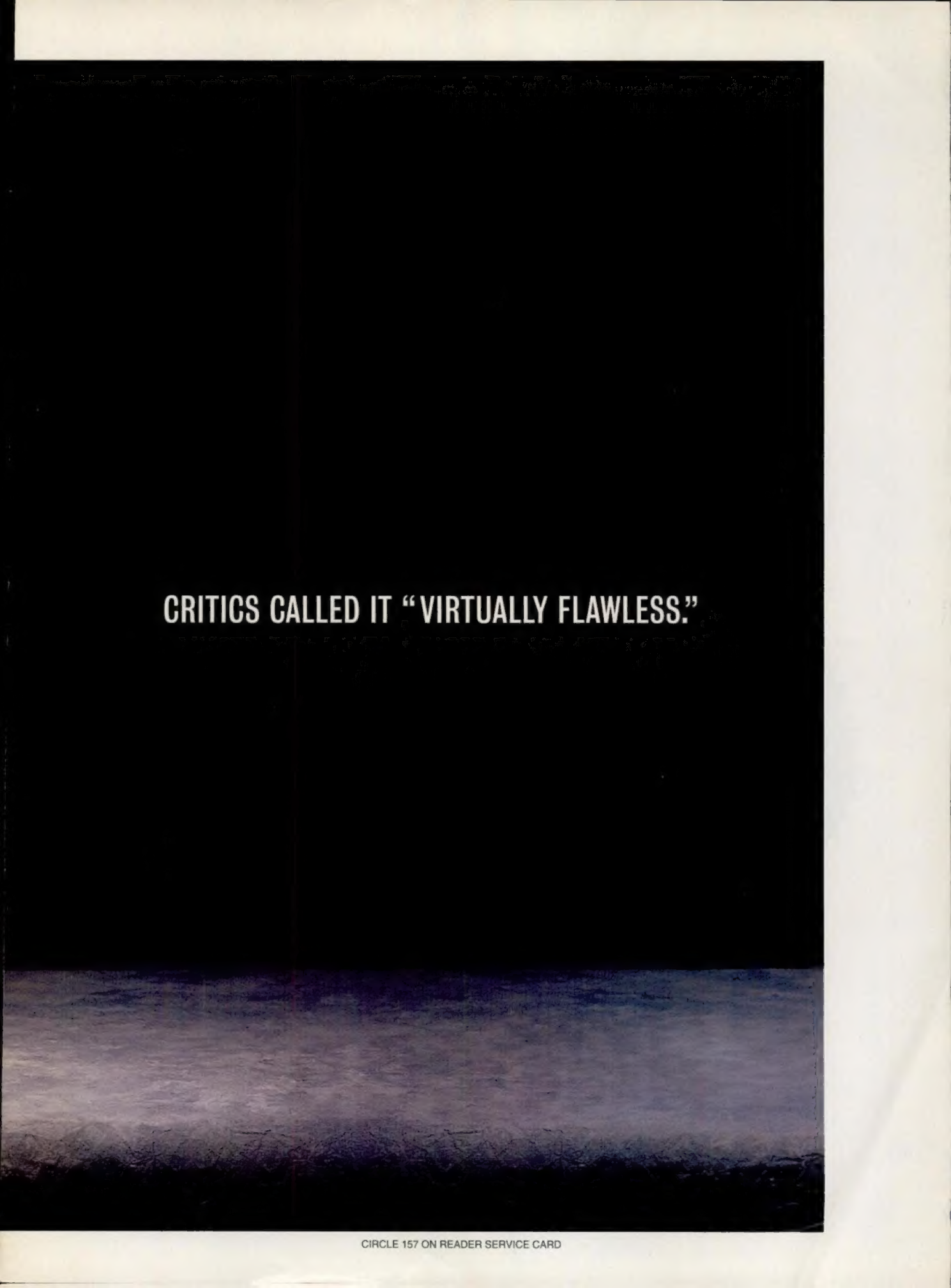
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Inside

After all the hype and free promotion it has received in the last year or so, it's about time the Internet got a job, rolled up its sleeves, and went to work like the rest of us. If you agree, you'll be happy to read in this issue that the Internet already is begin-

ning to offer much more than just Web browsing.

In our multipart feature "Collaboration on the Web," we review dozens of new or updated products that let you communicate with colleagues to share information, ideas, and tasks across the Net—in short, to get real work done using a wide variety of Internet connections and applications.

We take an in-depth look at the latest Internet-ready versions of groupware standbys, such as Lotus Notes and Microsoft Exchange, and at the latest in Internet e-mail clients and newsgroup readers. We also explore the emerging categories of Internet phone, videoconferencing, and collaboration products. Many of these products open up new collaboration possibilities for everyone, not just for business and professional users of the Internet.

What all these new products have in common is the potential to help anyone who has a computer use the Internet to be more efficient

and productive. Collaboration is already a big part of our day-to-day lives. Now that the Internet has also become an integral part of our daily activities, shouldn't it help us collaborate?

Speaking of collaboration, the articles in this package are the work of dozens of PC Magazine staff members and contributors. Under the steady hand of technical directors Ben Gottesman and Larry Seltzer, the project brought together the efforts of our Networking Team, led by senior editor Leon Erlanger, our Software Team, headed by senior associate editor Lance Ulanoff and associate project leader Dan Smith, and our Internet Team, headed by senior editor Thomas Mace and project leader Jay Munro.

When you finish reading their work, we think you will agree that no group ever made the Internet work harder.

—Jake Kirchner



LOGO DESIGNS BY MICHAEL DORET

PC Magazine, ISSN 0898-8507, is published twice a month except in July and August, for \$49.97 for one year. Ziff-Davis Publishing Company, L.P., One Park Ave., New York, NY 10016-5802. Periodicals postage paid at New York, NY 10016-5802 and at additional mailing offices. POSTMASTER: Address changes to PC Magazine, P.O. Box 54093, Boulder, CO 80322-4093. GST registration number: R-123669673; in Canada, R140496720. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement No. 266477.

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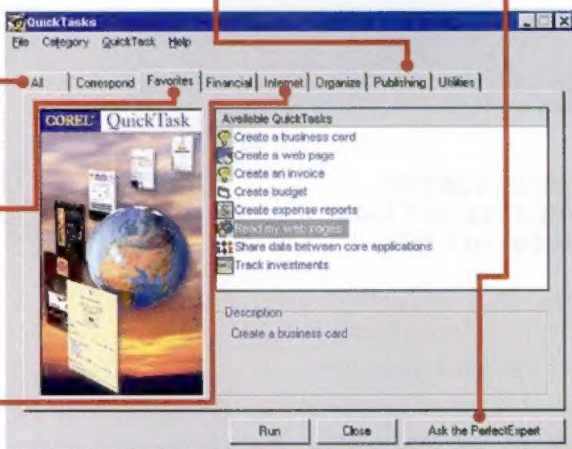
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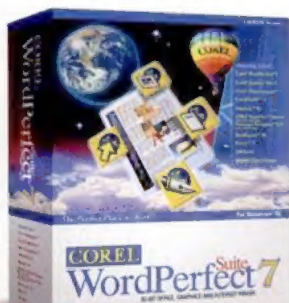
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COVER STORY

Collaboration on the WEB

The Internet is getting busy. In this special four-part cover story, PC Labs tests 41 products that use the Internet as

the underlying infrastructure for a variety of everyday business collaboration tasks—from simple e-mail dispatches to elaborate multipoint videoconferencing sessions, from cost-saving Internet phones to worldwide group discussions. The goal of all these products: to provide innovative, low-cost methods for people to work together and disseminate information, regardless of geography100

Real-Time Communication

Connecting on the Net

BY JON HILL, JAN OZER, AND THOMAS MACE *Internet telephones* let you call around the world—for just the price of your Internet connection. *Internet videoconferencing* bridges distance and brings colleagues together by providing a low-cost alternative to traditional proprietary solutions. *Internet collaborative tools* let far-flung coworkers sketch out ideas and coedit documents as a group102



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COVER STORY

Newsgroup Readers

Framing the Discussion

BY SEAN GONZÁLEZ The Internet's other world, newsgroup readers, enables you to participate in threaded discussions on a host of topics. We review nine such products, so you can decide



which tool gives you the best way to read your news and drive your discussions....163



BY EDWARD MENDELSON Over the past few years, Internet mail has emerged as a mainstay among individuals, personally and professionally. The epitome of effective communication, Internet mail enables you to send a mail message to anyone in the world, as long as you know where that person is @. We review a dozen e-mail clients to give you the scoop on how well each manages your e-mail183

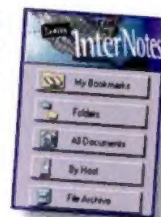
E-Mail

Building the Perfect In-Box

Groupware

Reaching for the Net

BY TONY POMPILI The Internet has changed the way we think about groupware. Lotus Notes and Microsoft Exchange are extending their messaging platforms to the Web to meet Netscape's Internet-based SuiteSpot on its own turf. We look at these three contenders, preview GroupWise 5 (the coming release of Novell's messaging system), and also report on traditional e-mail systems209



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FEATURE

17-Inch Monitors

Widen Your Horizons



BY JAMIE M. BSALES Sales of 17-inch monitors are booming, and it's no wonder: A larger display can make you more productive, and a good 17-inch monitor can be had for as little as \$650. The extra screen real estate will let you work comfortably at a higher resolution, so you can see more of your document, spreadsheet, Web page, or e-mail windows (and after hours, games are more of a blast, too!). We test 49 monitors aimed at everyone from budget-conscious home users to mainstream business users to graphics pros to help you see the bigger picture243

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February 20, 1996
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February 20, 1996
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120MHz Pentium STC 120



How fast is Sportster ISDN?

"The U.S. Robotics Sportster ISDN 128K stood out for its performance, ease of use, all-around flexibility, and reasonable price... it blew away the competition in our remote access tests, making it an ideal choice for telecommuters. The Sportster was a dream to install—you simply plug it in and go." PC World, August '96

"The Sportster ISDN 128K might have been named the Screamer. It was the only product in our test group to provide data compression, and this ISA-bus ISDN adapter, from U.S. Robotics, blew the other five products away on our performance tests." PC Magazine, June '96

"A top performer in our testing, the inexpensive, feature-rich Sportster 128K has 'buy me' written all over it... At only \$399, this internal adapter rockets you from place to place on the Internet at speeds of over 113 Kbps with none of the limitations imposed by a serial port." CNET, July '96

Let's just say light is starting to get jealous.

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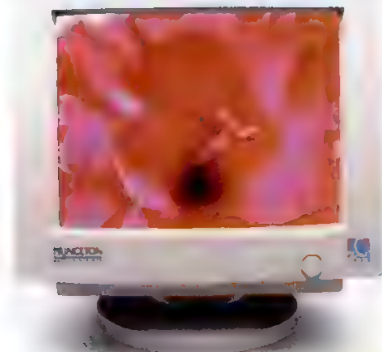
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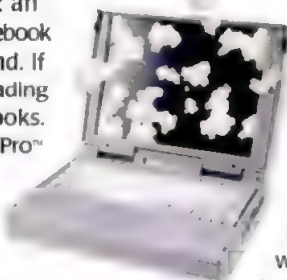
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Letters

FLUFF VS. STUFF

In your most recent review of the major on-line services ("Adapting to the Web," June 11, 1996), you state that CompuServe is difficult to use. My experience has been quite the opposite. I was able to begin using it with very little hand-holding or prior study. While it may not have America Online's cute interface and all the flashy graphics of a Web page, CompuServe has the information I need and allows me to find it quickly and without hassle. Add to this its unparalleled international accessibility and I think CompuServe is the clear winner among on-line services.

MARK SCHENK
St. Louis, Missouri

I enjoyed your recent comparison of online services. However, the article completely neglects auto-navigators, a key component that has a high impact on actual cost. Since CompuServe gives you the ability to have a program automatically grab forum messages and send replies, it enables you to do the majority of your work off-line where the meter isn't running. For this reason, CompuServe is far cheaper to use than services that require you to be online the whole time.

JOHN E. STITH
via PC MagNet

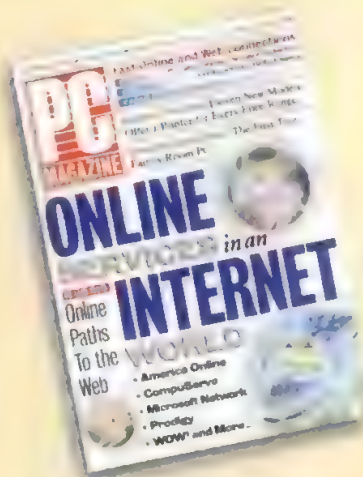
CompuServe, once the target of many scripts and tools, is shunning third-party developers. Combine this with terrible support and it's easy to see why CompuServe is getting buried by America Online. Developers such as myself are awfully tired of this treatment, and we look forward to the day when Internet access is not painfully slow and support software is readily available on vendor Web pages.

DAVE COHEN
via the Internet

I dispute your conclusion that CompuServe's interface is showing its age—the implication being that more graphics equals a better interface. As a subscriber to both AOL and CompuServe, I am glad that CompuServe has not fallen for all the fluff that AOL includes. Content is what's most important to me. When I need shareware, a printer driver, or help with an application, CompuServe is where I go.

RICK GUNGEL
via PC MagNet

Many OS/2 users are accessing the Web through the CompuServe and AT&T services using the IBM Internet Connection for OS/2. I would have thought that this would have been worthy of at least a mention. I would have liked to see a category regarding



*I'm glad that CompuServe
hasn't fallen for all the fluff
America Online has.*

OS/2 support by the various services.

BOB STEPHAN
via PC MagNet

PROBLEM/SOLUTION

I like to use my Netscape Navigator browser on the Internet and was interested in your brief mention of being able to use it through CompuServe as well. However, I have been unable to find the preconfigured log-on script that you say is on the Windows Plus pack CD-ROM. Rather, it asks for addresses and PPP protocols. I would have appreciated more details on how to use the Windows 95 dialer and Navigator to access the Internet through CompuServe.

ROBERT KELLER
via PC MagNet

To connect to CompuServe using the Windows 95 dialer and avoid entering a password/user ID manually, you don't actually need the Windows Plus pack. A small file available on CompuServe will allow you to do the same thing.

PAUL KOENIG
via PC MagNet

EASY ACCESS

I agree with Michael J. Miller ("Online Service or the Internet?", June 11, 1996) that CompuServe's depth and resources are more useful and easier to access than the Web. Unlike many technical-support phone lines, CompuServe forums have helped me many times in setting up hardware and software.

RANDY EVERETTE
Norfolk, Virginia

A PAT ON THE BACK

I would like to congratulate you on your excellent roundup of OS/2 REXX development tools. Your initial review inspired me to run out and buy VX-REXX, which I then used to build a Directory Compare and Synchronize utility. Your excellent review of other, similar packages allowed me to gain valuable insights into this arena.

KENTON C. POMPEY
via the Internet

PLATFORM PERSPECTIVES

Bill Machrone's comments concerning Java in his June 25, 1996, column, "The Web as Platform Manifesto," indicate a failure on his part to understand what Java is all about. The Java phenomenon is not about the language, it's about software platform independence. Java represents an open software platform allowing vendors to do whatever they want with their operating systems without forcing their competitors' software to become obsolete. In short, Java is the platform, not the Web.

GLENN H. JACOBSON
Sylvania, Ohio

The network computer is aimed at people who simply want access to information like online shopping, online banking, newsgroups, and e-mail. If that's all you want, why buy a full PC? Let's keep the intended use of the network computer in perspective.

WALTER NEWT
via the Internet

MORE INPUT

Your article "3-D Comes Alive" (June 25, 1996) helped me learn more about 2-D and 3-D graphics cards, but I still feel I'm not getting the entire picture. How about an article that takes into consideration all the elements of this technology for those of us interested in more than rendering images to a screen and providing a finished product? Many of us on the verge of making the leap into the 3-D domain would appreciate making the transition with a minimum amount of financial pain.

LARRY ACKERSON
via the Internet

Your article, though informative, lacked a major piece of information. That is, do these cards support dual screens under Windows NT? I know the Matrox Millennium does. That's the reason I use it in my company's Windows NT CAD machines. The people who use these machines can't run Bentley MicroStation with one screen nearly as efficiently as with two, hence the requirement for two screens. It would be helpful if PC Magazine tested dual-screen configurations

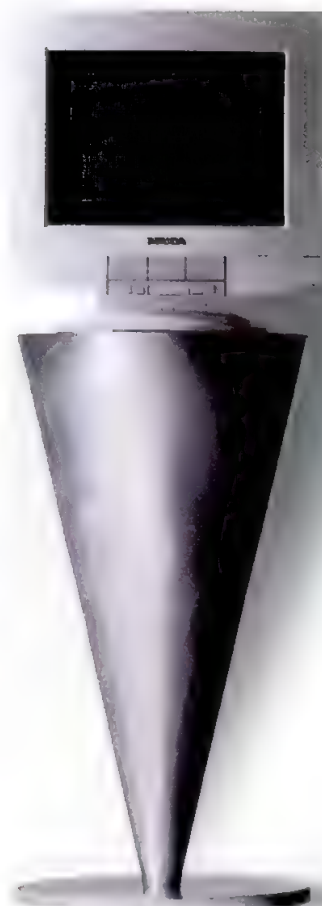
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NOKIA
MONITORS



Letters

when the card manufacturer says they are supported.

RON SOKOLOSKI
via the Internet

SOCIAL ISSUES

Bravo to Jim Seymour for raising critical social issues in his column "PointCasting the Future?" (June 25, 1996). The more we create customized news focusing our attention on our own narrow interests, the less we understand the broad social and economic issues we must all face if we are to survive as an interrelated, productive, and socially rich society.

SKIP ANDREW
Ashland, Oregon

Seymour's article in regard to PointCast and the dangers of narrowcasting strikes me as ludicrous. Does he actually think that we need to sift through the daily pabulum generated by broadcasts just for the chance that it may increase our society's collective cultural IQ? We aren't missing anything, because what we are getting on a regular basis is irrelevant or trivial. The concept of narrowcasting is a godsend for people with a wide range of interests and who are content-focused.

TOM KEOUGH
via the Internet

As a PointCast aficionado from the start, I read Seymour's article with great interest. I think the point that we miss in evaluating these new applications is that we tend to see things in black and white. I agree that narrowcasting shields us from a lot of random input that can be crucial to greater understanding and the de-

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CORRECTIONS AND AMPLIFICATIONS

In our August 1996 roundup "The Top 35 Portable Peripherals," we stated that the Fujitsu SCSI 600 Interface card had drivers for Windows 95 only (page 202). In fact, drivers are available for DOS, OS/2, Windows 3.x, Windows 95, and Windows NT.

In the same story, the prices we gave for the Pentax PocketJet portable printers (page 204) were incorrect. The 512K version has a street price of \$400, and the 2MB version, which we awarded an Editors' Choice, has a street price of \$550.

In our September 10, 1996, roundup of HTML authoring tools, "Web Authoring," the review of HTMLed Pro 32 lists the incorrect phone number for W3 Internet Services. (page 146). The correct number is 902-354-7464.

velopment of creativity. However, PointCast is not the only source of news for most people. So we need to evaluate it for what it is—a tool that can deliver targeted up-to-date information based on a specific profile.

MARC VERSCHAEREN
Luxembourg

THROUGH RAIN, SLEET, SNOW...

I disagree with your article "Internet Mail That's Made for Mobility" (June 25, 1996). I don't believe that IMAP4 (Internet Message Access Protocol, Version 4.0) will replace SMTP (Simple Mail Transport Protocol). IMAP4 is designed to improve and replace POP3 (Post Office Protocol). And SMTP is designed for transporting mail messages between two servers, while IMAP4 is designed to allow interactive manipulation of mail folders and mail messages between client and server. If there are users who are still in a "log on and off as fast as possible" mode, POP3 will still be used. IMAP4 requires more time overhead than is really feasible. However, for "always there" users, IMAP4 and its security features should improve the Internet electronic mail scene.

JACK DE WINTER
via the Internet

WAKE-UP CALL

I just read the First Looks review "Does Corel WordPerfect Suite Leave Office and SmartSuite in the Dust?" (July 1996). I'm glad, as other WP users surely are, that Corel is running the show now, particularly since it actually offers free user support. Maybe now Novell will wake up and listen to what users really want.

NEIL GUYTON
Denton, Texas

MOBILE ALTERNATIVES

Perhaps I missed the point of John C. Dvorak's column "Living Under a Microscope" in the July 1996 issue. It is already illegal to distribute pornography through the U.S. Postal Service, which is why the cited arrests took place. Just because the Telecommunications Act and relevant amendments sought to extend a similar level of regulation to the Internet doesn't mean that there has been an overwhelming cry for the elimination of the

Internet. In our society it is not unreasonable for some freethinking people to continue believing that pornography is harmful to a healthy social environment, yet many of today's free-speech champions act as though it is entirely appropriate to gag and ridicule those who believe differently from themselves.

NORRIE BUSH
Vancouver, Washington

I was impressed with Dvorak's observation on the media's overbearing scrutiny of new technologies. What disappointed me was that he didn't take it to the next level, namely answering why this happens. This is by far the more interesting issue. Why do the media tend to portray new technology as dangerous, and even evil?

PETE BYRNES
via PC MagNet

MCI BLOOPERS

I enjoyed Jake Kirchner's Pipeline column concerning MCI Mail's "abuse and vanity" rationale for raising prices ("I'm Just Glad Somebody Wants My Business," July 1996). It really hit the mark. I too canceled when the \$10 monthly minimum was announced. I was willing to spend the cash for what might be called a "backup" e-mail account. Moreover, MCI announced the increase with little lead time and then failed to refund the balance of my annual fee. While this whole matter may not be earthshaking, I agree that it reflects on MCI's customer commitment.

DAVID W. LANDRAM
via the Internet

GROWING UP, NOT OLD

I couldn't believe how appropriate I found your Second Looks article "Finding the Fountain of Youth for the IBM ThinkPad 720C" (July 1996), since I am currently in the midst of putting my own trusty ThinkPad 720C out to pasture and sinking money into a new machine. Your article was an eye-opener. I really felt there was no hope for improving its speed and overall performance.

PETER JANECKA
via the Internet

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The State of the Suites

Remember productivity software? You know: word processors, spreadsheets, presentation graphics, and the like—the reason most of us bought computers in the first place. Productivity applications have gotten little attention over the past couple of years,

as group connectivity and the Internet took center stage. But that doesn't mean we've come to the end of the evolution of productivity applications. Far from it. Most of us still spend the bulk of our computer time composing documents, looking at numbers, making presentations, and putting information into or pulling it out of databases. It's so commonplace now, we hardly give it a second thought. But there's room for improvement in the basic functions of these products, as well as in how they deal with the connected world.

Lately, Microsoft has been taking the wraps off of Office 97 in its usual studied way—one designed to stimulate a slow, steady stream of attention. Not to be outdone, Lotus has privately begun to show its plans for SmartSuite 97. Corel has already shipped new versions of its Corel Office and WordPerfect suites. As you would expect, the Internet and group connections are dominant themes of this year's suites. In many ways, Microsoft and Lotus are playing catch-up with the Internet features already in Corel Office 7, which let you convert files to and from HTML and embed hot links in documents.

Microsoft in particular has been pushing its Active Document support. This means that new versions of Internet Explorer and Microsoft Office will take advantage of ActiveX in such a way that you can edit an Excel or Word document within your browser or, conversely, view a Web page within Word. The demarcation between applications, browsers, and operating systems is rapidly disappearing. While Microsoft is pushing ActiveX, Corel is clearly in the Java camp. Corel Office 7 includes a technology called Barista that lets you turn WordPerfect, Quattro Pro, or Presentations files into Java-based documents, which you can then post on the Internet.

Both Lotus and Microsoft are pushing improved group features. Lotus pioneered this in previous generations, with things like Version Manager, in 1-2-3, and TeamConsolidate, in WordPro. Microsoft is now adding similar features to its products, and Lotus is extending its consolidation features, notably to 1-2-3.

Microsoft is finally adding a new information manager,



BOTTOM LINE

There's still room for improvement in the basic functions of these products.

Outlook, which will act as an Exchange front-end as well as manage your schedule, to-do items, and contact items, and keep track of your apps. Outlook will compete with Organizer in SmartSuite, Starfish Software's Sidekick 95 in the WordPerfect Suite, and InfoCentral in Corel Office.

All of this is well and good, but I'm still convinced that the most important thing is the power and simplicity of the base applications. And despite the emphasis elsewhere, we are seeing thoughtful improvements in this area this time around. Among the suites, Microsoft pioneered on-the-fly spell-checking in its word processor (though the feature actually goes back at least a decade, to Borland's Turbo Lightning), and WordPerfect and WordPro quickly followed suit. Microsoft is trying to take this a step further with a new grammar-checker that works on the fly as well. An interesting idea, if it works.

And there are other enhancements as well. Microsoft is improving its charting engine, which runs across all applications, and is adding a new shared drawing component. Lotus is adding new features, such as the ability to type "Total" in 1-2-3 and get a sum. Microsoft is adding a help feature called the Office Assistant that can look like a Claymation Einstein, among other characters, and that can stay on your desktop and offer you help when you need it.

And while all of these suites have long supported the idea of consistency across applications, we're finally getting a lot closer with developments like shared toolbars and a single Visual Basic for Applications across all Microsoft applications, and Lotus's InfoBox and Lotus Script. And Corel has done a good job of integrating the word processor, presentation package, and even the Quattro Pro spreadsheet acquired a couple years ago from Borland—although other components still remain separate.

All of these things could add up to office suites that are more capable, better integrated, and easier to use than ever. Ultimately, I'm convinced that what's most important isn't really the underlying technology, Internet hooks, fancy buzzwords, or the size of the final application. The true test is how well these applications help us with our day-to-day jobs. □

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Trends

TRENDS & TECHNOLOGIES SHAPING THE PERSONAL COMPUTER MARKET

Office 97 Targets the Web

Microsoft's overhauled application suite is coming in late fall.

At a technology conference with *PC Magazine* editors in Redmond, Washington, Microsoft representatives revealed new details about the upcoming Office 97 application suite, which will target integrating Microsoft's applications with Web standards and will introduce a slew of new features. Office 97—expected to ship by the late fall of 1996, with a Mac version coming by the summer of 1997—will bring new versions of Access, Excel, FrontPage, PowerPoint, Publisher, and Word, plus a new product called Outlook. According to Microsoft's Robbie Bach, director of desktop applications marketing, "twice as many hours of development have been dedicated to producing Office 97 compared with the previous version."



WEB SMART: Microsoft Internet Explorer's FindFast feature searches the Web on the fly.

Bach says that the integration of applications with the Web has been the top priority in developing Office 97. At the top of the Web-integration list is Active

Document support, which uses Microsoft's ActiveX technology to let Office applications—such as Excel and Word—integrate seamlessly within a Web browser—such as Microsoft Internet Explorer. Within the browser (a plug-in will allow users of Netscape Navigator to support Active Documents), you can edit and share Excel files, say, just as you would outside the browser. Microsoft Internet Explorer 4.0, due in the first quarter of 1997, will continue the Web-integration trend by becoming the universal graphical user interface within which the entire Windows operating system is incorporated. Even the Windows desktop will become a Web page.

Also on the Web-integration front, Office 97 users will be able to create and save documents from any Office application in native HTML format. You can publish Access databases in HTML format, complete with the ability to query and update the data dynamically. Within Office apps, you will be able to create hyperlinks to and from any Office, HTML, or third-party file on a Web site or file server. An Office Web toolbar with forward and back buttons will navigate be-

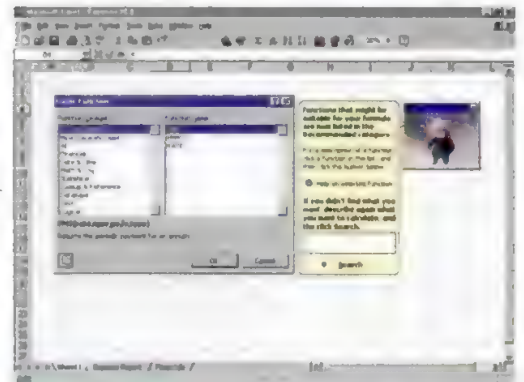
tween linked documents. Another feature, Web FindFast, can search across servers and HTML files for key words or file properties, using full-content index searching.

Help menus will feature links to Microsoft's Web-based help information.

One of the most interesting new usability offerings in Office 97 is the Office Assistant, an animated character you pop up on-screen by clicking on an Assistant icon. Although you can choose from a variety of characters, the Office Assistant Microsoft has demonstrated is represented as a small, Einstein look-alike that appears beside an information box full of tips. The Assistant presents context-sensitive advice, and this utility's underlying knowledge base is rich enough to help with complex and multilevel tasks, such as creating and then linking an OLE object between Office apps. The Assistant can respond to plain-language questions you type in, such as "How do I edit a chart legend?", as well as make guesses about what kind of help topics you will need during specific tasks, with tips appearing automatically.

Outlook, a product that Microsoft is temporarily describing as a "desktop information manager"

and that Microsoft CEO Bill Gates calls "the glue that ties everything we're doing together," is a new product slated to ship with Office 97. Outlook, a personal information manager-like application, creates one integrated environment for managing e-mail, schedules, tasks, and files. Outlook integrates seamlessly with Microsoft's Exchange Server, paving the



AUTOMATIC ADVICE: The Office Assistant in Office 97 pops up context-sensitive help.

way for enterprise-collaboration apps. For example, groups can share Outlook calendars, contacts, or tasks in a Microsoft Exchange Public Folder. Outlook is also designed to integrate with external communications standards, and it supports the major Internet mail protocols, including POP3 and SMTP. Within an Outlook e-mail message, users can create hyperlinks to internal or external Web sites, calendar items, contacts, and tasks. According to Microsoft vice president Pete Higgins, Outlook is targeted at "seamlessly integrating communications with desktop information, from electronic forms to calendar information."

Microsoft also promises new customized editions of Office, including ones for home and small-business users.—*Sebastian Rupley*

The Browser Brawl

Microsoft pushes freebies; Netscape answers back.

"This product is priced to sell," said Bill Gates at Microsoft's unveiling of the Internet Explorer 3.0 Web browser, in San Francisco. The browser is now downloadable for free from Microsoft's Web site; Microsoft claims that over 900,000 downloads occurred in its first week of availability. Gates also delivered a surprise: Microsoft has struck deals with several popular fee-based content providers on the Web so that users of Internet Explorer can get free content for which they'd otherwise have to pay. Netscape answered back, announcing similar partnerships with even more fee-based content providers.

Among Microsoft's deals: ESPNet SportsZone, Hollywood On-Line's Insider Reports, Investor's Edge (analyst reports), MTV's Choose or Lose fee-based chats, Riddler's gaming site, and The Wall Street Journal Interactive Edition. Microsoft also has a deal with MicroWarehouse, which will offer discounted and free software exclusively to users of Internet Explorer. Netscape has more than two dozen content partners, including *The New York Times* and the Quote.Com stock-quote service.

Netscape has reacted to the unveiling of Internet Explorer 3.0 by arguing, at its Web site, that Internet Explorer is larger, slower, and less

secure than Netscape Navigator 3.0, which was also just made available. *PC Magazine's* issue of October 22, 1996, will offer full performance comparisons of the two browsers, but our early tests have already shown that Java performance is better in Internet Explorer than in Navigator. Netscape's tests show Navigator 3.0 as 83 percent faster than Explorer 3.0 at loading Silicon Graphics' home page and 64 percent faster at loading Microsoft's home page. In a conference call with *PC Magazine*, Microsoft officials questioned Netscape's data and said rebuttals would be available at Microsoft's Web site.

Microsoft's Gates said he sees big advantages in using Internet Explorer 3.0 for enterprises. He especially emphasized the incorporation of NetMeeting voice/data collaboration technology, and also pointed to the fact that

Internet Explorer 3.0 allows users to browse any documents that support OLE. You can view and edit Excel and Word documents, say, directly within the browser. There is also a new feature in Internet Explorer 3.0 that lets

users enter queries directly into the Address window atop the browser. The feature automatically goes out to the Yahoo! search engine.

In addition to performance claims, Netscape officials have stressed that the Navigator 3.0 browser is available on 16 platforms. Gates said that his company is working on Macintosh and Unix versions of Internet Explorer 3.0, and that both America Online and CompuServe offer Internet Explorer 3.0 for built-in browsing.—*Sebastian Rupley*



Intel's CPU Supply Shortage

September saw waits for 200-MHz Pentiums.

As the demand for high-end processors moves along at an unprecedented pace, Intel has grappled with delays and supply shortages for some of its 200-MHz CPUs. Intel confirmed an August/September supply shortage of 200-MHz Pentium chips, which system manufacturers cite as causing 15- to 30-day waits.

Intel has also decided to delay its P55C chip—the first Pentium CPU to incorporate the MMX instruction set and multimedia extensions—until the first quarter

moving toward the very high end of the Pentium generation to the same move in demand toward the high end of, say, the 486 generation, things are happening much faster." Spindler notes, however, that demand for 166-MHz CPUs is not trailing off—it is, in fact, growing.

Jill Shenks, of Dell Computer, says her company has had "constraints on 200-MHz Pentium systems, and buyers experienced waits of 15 days in the August/September time frame." Gateway

age of the 200-MHz P55C chip caused the delay in its release. The delay will, of course, mean a greater availability of software that uses the MMX instruction set, but Spindler emphasized that lack of support for MMX was not behind the delay of the chip. "We just saw that we couldn't meet our OEM's requirements," he says. The delay in the P55C's ship-

ment will mean that the chip misses the holiday buying season. Intel has plans to follow the P55C with the introduction of a low-cost version of the Pentium Pro chip for the consumer market. Code-named Klamath, the chip will incorporate the MMX multimedia extensions and instruction set and will run at speeds of up to 233 MHz.—*Sebastian Rupley*

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PC MAGNET. From this online service of ZD Net available through CompuServe (GO PCMAGNET), you can download *PC Magazine* utilities (GO TIPS) and join in freewheeling discussions about new products (GO EDITOR). **First Looks Plus:** From Sept. 23 to 27, discuss Corel Click 'n' Create with industry reps and reviewer Steve Plain.—*Tin Albano*



ILLUSTRATION BY BEATA SZUBIA

of 1997. The company had planned to make the P55C available in the fourth quarter of 1996.

According to Intel's Frank Spindler, marketing manager for Pentium processors, "If you compare the rate at which buyers are

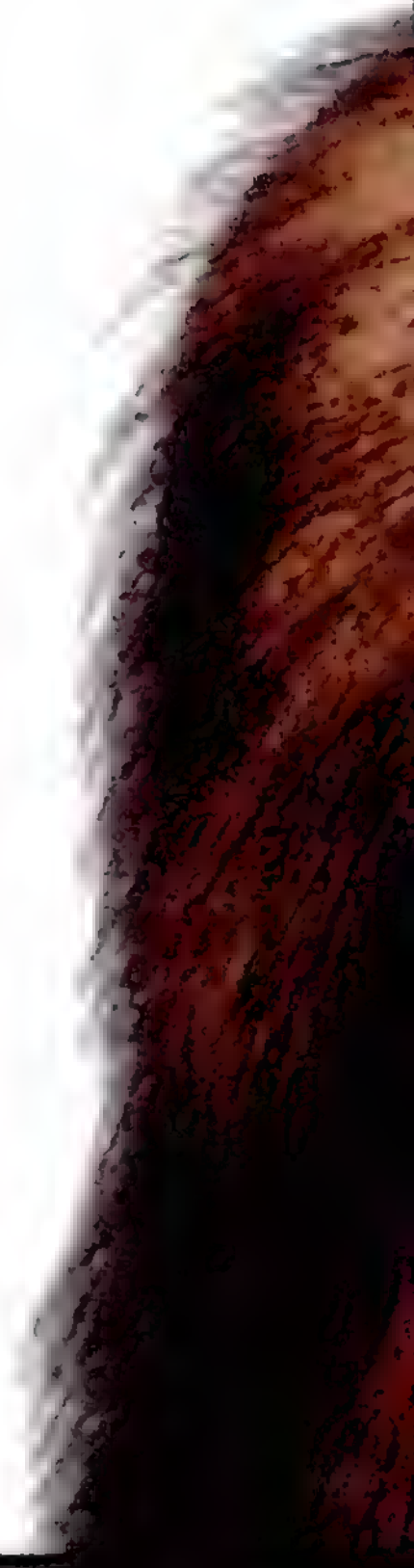
and Micron have reported slightly longer delays for the same systems, although there were no significant waits reported for systems based on 200-MHz Pentium Pro chips.

Spindler says a projected short-

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A New Spin on 3-D Graphics

Talisman aims to supercharge computer graphics.

"It's great to finally talk about it," says Jim Kajiya, senior researcher in the graphics group at Microsoft Research, referring to a two-year-old research project, code-named Talisman, that aims to change the core of PC graphics architecture with a low-cost approach to 3-D graphics.

Microsoft Research has kept a low profile since its inception, in

1991, with a handful of people working in basic and applied research. The group has grown to include over 100 members, and Microsoft intends it to rank among the top computer research labs in the country.

In fact, out of the 52 technical papers presented at a recent conference on computer graphics, 10 were from Microsoft—a record



number of papers accepted from any one company.

Kajiya's challenge: figuring out how the PC, with all its bandwidth and memory constraints, can deliver high-quality 3-D graphics. Talisman is a hardware reference design that replaces the conventional frame buffer to allow applications the freedom to render and animate objects at quality levels dictated by the application rather than by the frame buffer. Talisman conserves video memory and attempts to streamline the process by reusing frames instead of completely regenerating them—a memory-intensive task.

"Every graphics architecture struggles against bandwidth limitations. Talisman removes the hardware problem so that we can do software that we want to do, such as 3-D Windows," Kajiya

says. Microsoft expects Talisman to show up in late 1997 on motherboards and graphics cards.

Today, Talisman is just a paper design described in a document entitled "Talisman: Commodity Real-Time 3-D Graphics for the PC." No chips based on Talisman specifications have been built yet, and it remains to be seen whether graphics card developers will adopt it. In the meantime, Microsoft has developed software that simulates Talisman and has produced a test case—a short animated film—that debuted at a recent digital film festival in New Orleans.

The bottom line, says Kajiya, is that "the PC will look a lot more like what you see on TV. It won't be the geeky stuff with polygons and swords but the real stuff."—Carol Levin

The Talisman Test Case



The digital film *Chicken Crossing*, produced and directed by Microsoft researcher Andrew Glassner, demonstrates Talisman's low-cost 3-D techniques. Rather than completely regenerating a scene, Talisman-enabled graphics cards conserve memory by reusing

the frame—bending and warping the image and then re-rendering it.

Another trick, "chunking," conserves memory by splitting a scene into chunks, compressing them, and computing each one separately. Microsoft claims storage requirements for images are smaller by a factor of 60.—CL

Software That Sells Itself

Is this the end of shrink-wrap?

A by-product of the Internet's tremendous growth is its increasing popularity as a medium for distributing free software, add-ons, and upgrades. In an effort to extend this phenomenon to packaged software, several firms have sparked a growth of new innovations that make it possible to purchase and download fully functional software instantly over the Internet.

Release Software's SalesAgent 2.0 is one such product poised to change the digital marketplace. This new sales tool is a module designed to be embedded within a program, making it possible for the program to sell itself. SalesAgent is distributed according to the now-familiar strategy of giving away software, letting users become addicted, and then forcing

them to buy it. The module is activated after a predetermined number of days or levels, or after a user decides he needs a feature that's unavailable in the trial version. SalesAgent offers a number of ways to complete a purchase:



phone, fax, credit card, direct modem, and now, the Internet.

For all the advantages, several hurdles stand in the way of these products' success. A major one is the Internet's limited bandwidth. With slower connections, even

small programs can take hours to download.

According to industry analyst Tim Bajarin, people are simply locked in to the traditional model: "People like to pick up the box, read the back, pick up another box. . . ." Bajarin doesn't see electronic distribution replacing traditional channels soon, but he does believe that down the road, electronic distribution will dominate.

A shift to electronic distribution could help level the field for smaller developers by giving them an alternative to competing for shelf space. It could also facilitate the move to a subscription-based pricing model in which you

"could buy a game by the level, or lease software," Bajarin explains.

Numerous companies offer similar products, such as IBM's Cryptolopes and Intertrust Technologies' Digibox. These tools are more limited and have yet to get off the ground.—Jon Kaufthal

Top CD-ROMs

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- 2 Duke Nukem 3D 3D Realms
- 3 Warcraft II: Tides of Darkness Blizzard
- 4 Corel WordPerfect Suite Upgrade Corel
- 5 Civilization II MicroProse
- 6 Myst Broderbund
- 7 Final Doom GT Interactive
- 8 Command & Conquer Virgin
- 9 Microsoft Plus! Microsoft
- 10 The Need for Speed Electronic Arts

*Source: PC Data. Data for July 1996.

By Jake Kirchner

Will Rogers Never Cruised the Net

I have to thank J. Paul Grayson, Micrografx CEO, for a comment of his that's haunted me for the last six months. On the occasion of his company's introduction of its nifty ABC QuickSilver Internet product, Grayson noted the rapidly growing importance of the Internet, particularly the Web, to all. He added casually that "someday we'll know more people online than we know in person." Now there's a thought to chill the soul.

If you've spent as much time online as I have over the past ten years—participating in bulletin boards and newsgroups, moderating online service forums and chat rooms, fielding dozens of e-mail messages a day from readers and various strangers—you have probably bumped up against as many obnoxious, rude, and insulting correspondents as I have.

It's not that I'm more thin-skinned than the next person. I've received too many angry letters from outraged readers over the years to be put off easily by strong-minded correspondents, no matter where or how I meet them. And while online I've certainly made some good friends, met many wonderful people, and jousted with some interesting, challenging people with wide-ranging interests and keen intellects.

But admit it. We've all run into far too many netizens whose sole purpose in life seems to be to cruise from forum to forum, flaming everyone in their paths. As hosts of a forum on CompuServe, for example, we at *PC Magazine* participate in lots of lively debate and healthy give-and-take on dozens of topics. But on a regular basis,



Far too many netizens cruise from forum to forum, flaming everyone in their paths.

crashing boors whose fingers work faster than their minds drop in to insult the intelligence, ethics, and parentage of anyone who dares to disagree with their philosophies or points of view. Although they're a small minority, these drunks at the Internet bar can drive the average folks right out of a forum or chat room.

Of course, old-timers lament even the rash of newbies polluting online environments with bumbling questions, untutored ways, and poor netiquette. But at least most of the newcomers are polite about it.

One finds more common courtesy on the subways of New York than in the online world. With the expansion of the Internet, though, that may be changing. As you can read in the article below, a recent Nielsen survey found that the number of Americans and Canadians with access to the Internet jumped 50 percent in the few months between August 1995 and March 1996. Given the continuing expansion of the Internet, we can assume it's growing at a similar pace today.

The survey also found the newcomers are more representative of the North American population as a whole than are the hackers and gearheads who were the first-generation online.

If Grayson is right in his comment that we're going to end up counting the folks we meet online as the majority of our acquaintances and friends, I hope for all our sakes that all of them—old-timers and newcomers alike—will remember that the golden rule is as applicable online as it is anywhere else.

Internet Crowd Diversifies

Survey shows demographic shift to mass market.

In less than a year, the number of Internet users has increased by 50 percent, and the demographic profile has shifted from a preponderance of upscale, college-educated men to a distribution more in line with overall population averages, concludes a recent CommerceNet and Nielsen Media Research survey of 2,800 Internet users.

The key findings include the following statistics:

- 22 to 24 percent of people ages 16 and older in the U.S. and Canada have access to the Internet, up 50 percent from last year.
- Among longtimers (those who had used the Internet in the 3 months prior to August 1995), 67 percent are male, 88 percent own a

home computer, 55 percent have at least a college degree, and 27 percent live in a household with an income of \$80,000 or greater.

- Of the newcomers, 60 percent are male, 72 percent own a home

computer, 39 percent have at least a college degree, and 17 percent live in a household with an income of \$80,000 or greater.

- 23 percent of longtime users are computer professionals; only 11 percent of newcomers view themselves as computer professionals.

These trends are relevant for several reasons, according to Nielsen.

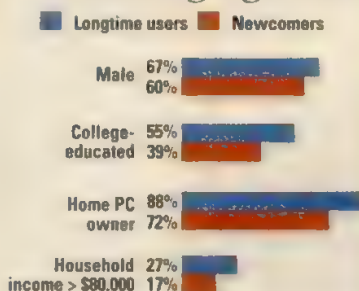
First, they validate that the hypergrowth of Internet usage is a reality and not just hype. Also, the shift in Internet users' profiles reflects the fact that the general population is embracing the Internet, a sure sign that the Internet is quickly reaching the mass market.

In addition, the survey also probed why people no longer have access to the Internet. 21 percent

of the respondents who had access in August 1995 and 11 percent of those who had used the Internet in the prior three months no longer had access in March 1996. Among the reasons for this turnover: 14 percent no longer needed to access the Internet, 13 percent changed jobs, 12 percent canceled their online service, and 10 percent found access too expensive. Also, newcomers are less likely to have used the Internet in the past 24 hours, and they use the Internet less frequently than longtimers do.

Although demographic details are valuable to companies hoping to profit from the new cyberconsumer, reporting on the population's size and characteristics is not an exact science. Even the Nielsen Media Research group admits that the Internet is a difficult medium to measure.—Angela Hickman and Carol Levin

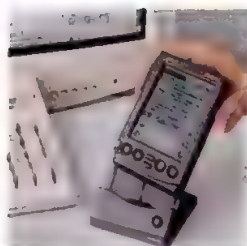
The Changing Web



Source: CommerceNet and Nielsen Media Research.



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U.S. Robotics

First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

ISDN

ISDN Comes Home with Fast and Affordable Digital Adapters

By Alfred Poor

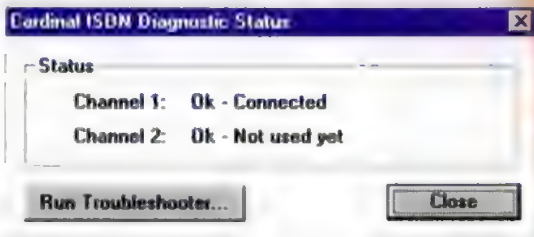
If navigating through your favorite Web pages via modem has become more and more an exercise in cyberspace futility, why not go digital with a system that taps into the speed of the Integrated Services Digital Network (ISDN). A new generation of devices are at the forefront in providing inexpensive and easy-to-use ISDN adapters, and they demonstrate that this technology is ready to get down to business.

These three ISDN adapters, from Cardinal Technologies, Diamond Multimedia Systems, and Motorola, are not only able to pipe data more than three times as fast as the theoretical top rate of a V.34 modem, but they do so for the same cost as a modem—or slightly more. The \$200 Cardinal Technologies IDC 100i, the \$300 Supra NetCommander ISDN from Diamond Multimedia, and the \$400 Motorola BitSurf Pro ISA are internal adapters that are intended for those who don't

have corporate support. They place the emphasis on ease of use, diagnostics, and reliability over all other considerations.

FASTER, CLEANER, CHEAPER

The fastest V.34 modems are limited to a hypothetical top



UTILITARIAN: The Cardinal IDC 100i's status utility provides quick access to a handy diagnostic application.

speed of 33.6 kilobits per second (Kbps), which is often not attained even under the best conditions. In contrast, an ISDN connection has a pair of B-channels, each of which can handle 64 Kbps of data, both coming and going. Combined, these two data channels offer an effective overall throughput of 128 Kbps. As a bonus, a digital connection is by its very nature cleaner than even the best analog line and less susceptible to noise.

Adding ISDN to your PC installation is getting less expensive as well. Since *PC Magazine*

reviewed six ISDN adapters ("Fast Connections," June 11, 1996), the price of an ISDN adapter has dropped from about \$700 to between \$200 and \$400.

At first glance, these ISDN adapters have a lot in common: All three are 16-bit ISA cards with Microsoft Windows 95 Plug and Play support, which goes a long way towards eliminating many of the start-up and configuration roadblocks to the information highway. In addition, each works with all the common American ISDN switching standards: NI-1, Northern Telecom

DS-100, and AT&T 5ESS.

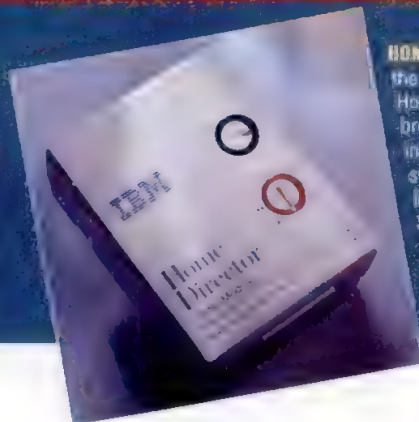
Unlike some early ISDN adapters designed for an office setting, these three adapters include everything you need to get going digitally, including a built-in network terminator, or NT-1. You just insert the board in your PC, plug the adapter into the phone jack in the wall, configure the software and Windows 95, and dial.

HIGH-SPEED ON-RAMP

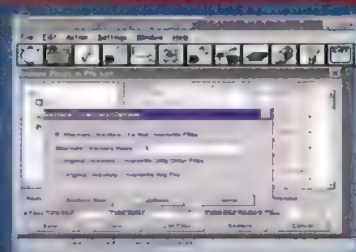
These ISDN adapters also support the Multilink PPP (MP) standard, though they vary in

IN THIS EDITION OF FIRST LOOKS

- Hurricane 2.0
- Corel Click & Create
- LivePro 629
- Easy Site
- Five Books on Linux
- Adobe PhotoDeluxe 1.0
- Fujix DS-220 Digital Card Camera
- Kai's Power Geo
- IBM VoiceType 3.0 for Windows
- Adobe Type Manager Deluxe
- Act! for Notes
- Maple V Release 4



HOMEMAKER: Let the IBM Active with Home Director brew your morning coffee and switch off the lights at night. See page 51 for the full review.



CYBER CACHE: New storage services let you back up important files online. See page 50 for the review.

First Looks

how they implement this feature. Using MP makes it possible to run simultaneous connections on the two 64-Kbps B-channels and significantly reduces download time for moving large files.

In addition, BitSurfr and NetCommander use dual-purpose designs that allow you to connect an analog device as well as your PC; the Cardinal IDC 100i is ISDN-only. The BitSurfr and NetCommander let you use a 64-Kbps digital channel for navigating the Web or connecting to a corporate server, and you can hold a phone conversation on the other channel at the same time or leave it open to receive a fax.

The BitSurfr goes a step further: It has the ability to connect to a pair of analog phone lines. The NetCommander has one line, to which you can connect two analog devices.

POWER HUNGRY

Because these adapters are powered by the PC, the analog phone line works only as long as the PC is powered up. The NetCommander has no facility for external power, so you'll need to keep your PC on 24 hours a day. The BitSurfr gives you the option of connecting an external power source to the card so that it receives power regardless of whether the computer is on or off.

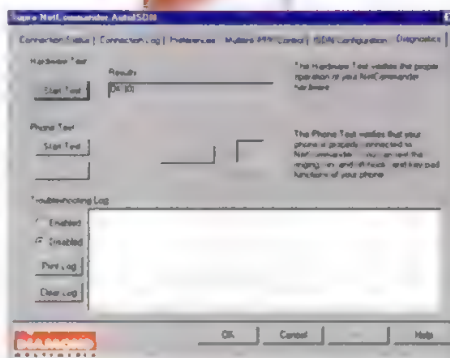
We tested this trio of ISDN adapters using Windows 95 and its Dial-Up Networking feature with Microsoft Internet Explorer 3.0 as a Web browser. Performance

was a non-issue: All three adapters quickly reached full speed and stayed there. We had no trouble downloading multimegabyte files from both the Web and FTP sites, and we zipped from home page to home page effortlessly.

By the time you read this, two modem-makers will offer ISDN PC Card devices as well. Both the Angia I-bahn ISDN and Connectware's PhoneWorks ISDN+ PC Card have shrunk the electronics to the size of a credit card and offer an element of mobility. But don't expect to see hotel rooms with ISDN connections any time soon. We expect that roving executives will use these cards to connect digitally from satellite offices. Expect a number of ISDN PC cards from a variety of vendors this fall.

If you have a need for speed, the BitSurfr, Cardinal IDC 100i, and NetCommander cover a wide spectrum of capabilities and features. The IDC 100i delivers a lot of bandwidth for the buck. The BitSurfr costs twice as much, but it has all the bells and whistles. The value choice is the NetCommander, which stakes out the middle ground by offering an excellent assortment of software and diagnostic features at a price that's easy for small-business operators to swallow.

Whether it's for getting the



WHAT'S WHAT: The Supra NetCommander ISDN comes with a powerful AutoISDN utility that includes status information, a call log, and this diagnostic screen.

The company is able to offer this low price by delivering the bare minimum in features. The IDC 100i doesn't support distinctive rings for multiple lines, and its lack of an analog phone jack reduces it to a purely digital role.

Thanks to a clever installation routine, the IDC 100i was easy to get going. We chose to use the Windows 95 Dial-Up Networking in lieu of the included Chameleon Internet Starter Kit from NetManager. But to get the most out of a MP connection, we had to use the Chameleon software. The board also came bundled with a copy of Microsoft Internet Explorer 2.0, which we skipped over in favor of the newly released Version 3.0.

Once you're up and running, a pair of indicator lights are added to the Windows 95 taskbar so that you can monitor the status of both digital channels. And if something should go wrong, there is a handy troubleshooting utility that is effective but is not as extensive as those in the BitSurfr and NetCommander.

Cardinal Technologies may have kept the feature list short, but they back the card with an unmatched warranty. If the adapter fails to work for the original owner, the company will fix or replace it for free for the first year. After that there's a \$25 shipping-and-handling fee.

Making the Connection: ISDN Adapters

✓ YES ✗ NO

Products listed in alphabetical order

	Cardinal Technologies IDC 100i	Diamond Multimedia Supra NetCommander ISDN	Motorola BitSurfr Pro ISA
Street price	\$200	\$300	\$400
Physical indicator lights	None	Status LED on bracket	None
Windows 95 taskbar display	✓	✓	✓
Adds or drops second B-channel as needed	✗	✓	✓ (Analog calls only)
Number of RJ-11 analog phone jacks	0	1	2
External power connector	✗	✗	✓
Software included	Microsoft Internet Explorer 2.0, Chameleon Starter Kit	Microsoft Internet Explorer 2.0, AutoISDN utility, Microsoft ISDN Accelerator Pack for Windows 95	VCOMM port driver for Windows 95, WinISDN driver for Windows 3.x
Switch support for NI-1, DMS 100, and 5ESS	✓	✓	✓

First Looks

During testing under a variety of conditions, the Cardinal IDC 100i achieved full communications speed faithfully. If you're looking for the least-expensive way to connect to the Web digitally—and only digitally—the Cardinal IDC 100i is the way to go.

Cardinal IDC 100i. Street price: \$200. Requires: ISA slot, ISDN connection. Cardinal Technologies, Lancaster, PA; 800-775-0899, ext 2402, 717-293-3000; www.cardtech.com. *Circle 433 on reader service card.*

DIAMOND MULTIMEDIA SUPRA NETCOMMANDER ISDN

The next step up in price and features from the Cardinal IDC 100i is the \$300 Supra NetCommander ISDN from Diamond Multimedia. The extra \$100 buys you some handy software that increases the usefulness of ISDN and your PC.

For example, most ISDN adapters that support MP dual-channel connections require you to make the initial connection with both channels at once. With the NetCommander the initial contact is made using only one of the two channels. When the data transfer load requires additional bandwidth, the NetCommander software establishes a link with the second channel. You can even configure the length of time before the second channel is added or dropped.

Like the IDC 100i, the NetCommander adds a pair of indicator lights on the Windows 95 taskbar upon installation. Double-click on either of the light icons to open Diamond's AutoISDN utility. This comprehensive program is a one-stop digital-connection-monitoring suite that provides important feedback on current conditions, a log of prior sessions, and a series of configuration screens. AutoISDN's strong suit is its diagnostic section, which lets you test both the adapter and an analog phone plugged into the card's RJ-11 jack.

DUAL-PURPOSE JACK

The card has only a single analog jack, but you can set it up to

respond to distinctive rings for the two different phone numbers that are assigned to your ISDN line. If your phone equipment supports the distinctive-ringing feature, you can plug a fax machine and an answering machine into the same jack and give each a separate phone line. The equipment can determine which device is being called when the corresponding line rings.

In addition, only the NetCommander offers a nonsoftware diagnostic. The LED on

that can be inexpensive for heavy users to run.

Supra NetCommander ISDN. Street price: \$300. Requires: ISA slot, ISDN connection. Diamond Multimedia Systems Inc., San Jose, CA; 800-468-5846, 408-325-7000; www.diamondmm.com. *Circle 434 on reader service card.*

MOTOROLA BITSURFR PRO ISA

The external version of the Motorola BitSurfr Pro shared Editors' Choice honors in our latest roundup of ISDN adapters ("Fast Connections", June 11,

but it was not as flexible or useful as the corresponding feature in the Supra NetCommander. While the NetCommander can add and drop an extra data channel easily, the BitSurfr Pro requires the use of both channels to start a combined MP session.

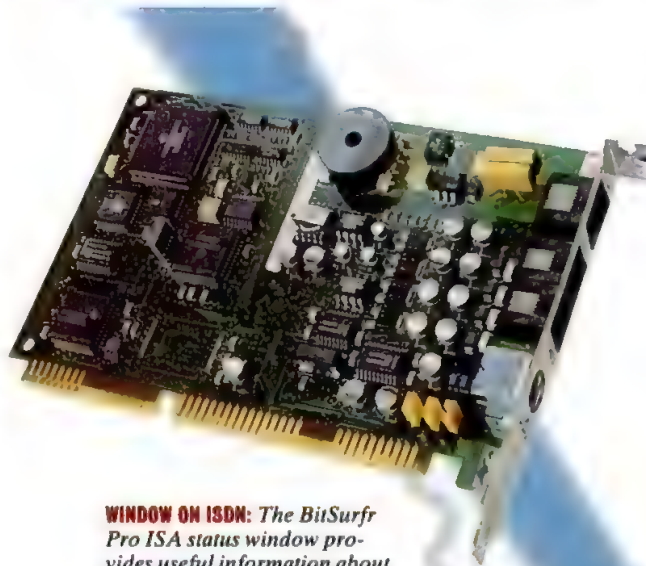
Dynamic allocation comes into play when you either place or receive an analog phone call and both channels are transmitting at the time. The BitSurfr card then drops one channel to make it available for the analog call; when that call ends, the BitSurfr reestablishes the second-channel connection for full-bore digital communications. The BitSurfr can move smoothly from dual-channel Web access to using a single channel for the Web and another for an incoming fax or phone call.

The BitSurfr card is the best of the bunch in terms of providing analog-phone support. Like its external cousin, it has a pair of analog-phone-line jacks. Motorola also provides a connector on the card bracket for an optional adapter that keeps the board fully powered and the phone lines open and ready. That way you can use the analog lines whether the PC is on or not.

The BitSurfr comes with communication port drivers for Windows 95 and Windows 3.x, as well as indicator lights for the taskbar in Windows 95; no Web browser is included. BitSurfr has the most extensive printed documentation of these three products.

During our evaluation, the BitSurfr was able to send and receive data at full speed from start to finish. If you're looking for an excellent multipurpose adapter that can satisfy the demands of both digital and analog use, look no further than the Motorola BitSurfr Pro ISA.

BitSurfr Pro ISA. Street price: \$400. Requires: ISA slot, ISDN connection. Motorola Information Systems Groups, Huntsville, AL; 800-365-6456; www.mot.com/isg. *Circle 432 on reader service card.*

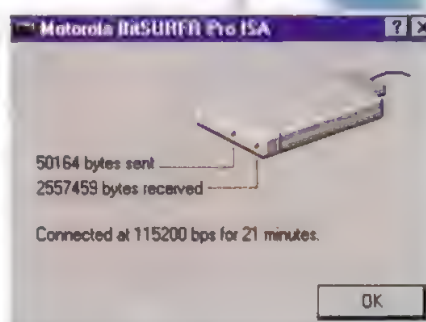


WINDOW ON ISDN: The BitSurfr Pro ISA status window provides useful information about your adapter's connection.

the card's bracket can be useful for determining that the ISDN line is functioning correctly, but it's inconveniently located on the back of the PC.

The card came bundled with Microsoft Internet Explorer 2.0, and the company plans to roll in Version 3.0 this fall. The package also included a copy of Microsoft's ISDN Accelerator Pack for Windows 95 and an online manual that was remarkably thorough and useful.

During testing, the NetCommander was able to transmit and receive at full ISDN speed. The adapter's extended features not only make it easy to use, but they make it an ISDN adapter



1996) and the internal BitSurfr Pro ISA is a winner too. But with an expected street price of \$400, it is the most expensive of the three cards in this group and roughly double the price of the Cardinal ID 100i. Considering all it provides, the card is well worth its price tag.

The BitSurfr has an interesting feature that Motorola calls dynamic bandwidth allocation,

Microsoft Internet Explorer 3.0



Microsoft Internet Explorer

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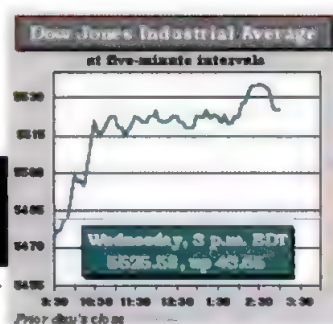
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WINDOWS UTILITIES

Hurricane 2.0 Squeezes the Most Memory from Your System

By Bernie Yee

The premise is inviting: Get better performance without paying for a costly memory upgrade. When RAM prices were sky-high, consumers were lining up to buy RAM compression utilities. Now that RAM prices have plummeted, you can purchase 8MB of RAM for about \$120

with Stacker-licensed compression, it can make the unused RAM perform like additional memory.

What's so clever about Hurricane 2.0 is where it finds more memory—in your graphics card. Typically, a system running at

Under ZD Winstone 96, Hurricane 2.0 yielded quite impressive results on systems with 8MB of RAM. Hurricane 2.0 is especially ideal for notebooks, because notebook memory remains relatively high-priced (between \$200 and \$250 for 8MB). And upgrading some notebooks may mean throwing out perfectly good RAM, something users are loath to do. With Hurricane enabled, our test system—a TI Extensa 550 notebook with a Pentium/75 CPU, 8MB of RAM, and 768K of video memory—logged nearly a 15 percent performance increase on ZD Winstone 96.

Hurricane 2.0's memory management benefits desktop systems too. The ZD Winstone 96 score for our test desktop PC—a Compaq Presario 9250 with 8MB of

to purchase dated 30-pin SIMMs. We saw similar results under ZD Winstone 32.

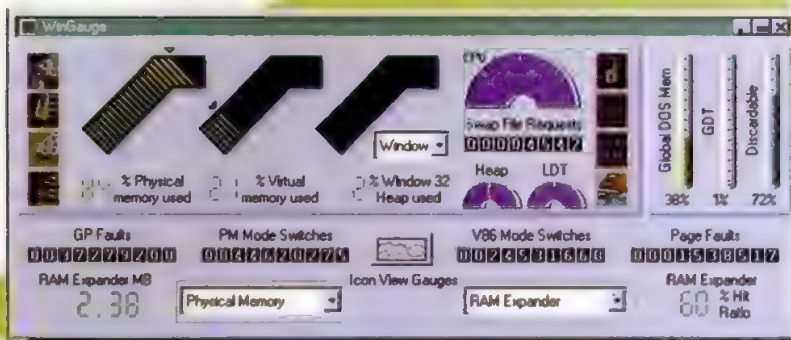
PACK IT IN

Even if you have plenty of system memory, Hurricane's new WinPack feature comes in handy. WinPack adds a fourth button to the title bar. Rather than just minimizing applications, WinPack also compresses them, while still maintaining background execution. The program decompresses when accessed. An IBM ThinkPad 755CD with 24MB of RAM, running Word 7 and ECCO Pro 3.0 simultaneously used 85 percent of physical memory and 20 percent of virtual memory; when both applications were WinPacked, memory utilization dropped to 78 percent and 19 percent, respectively, freeing up 480K of physical memory.

Hurricane 2.0 comes with a slew of utilities too—among them RAMDisk, the WinGauge resource meter, and Discover, an excellent system analysis utility. Hurricane 2.0 does not yet support Matrox graphics cards, though Helix plans to introduce a patch soon. And a maintenance release, Version 2.02, will correct some bugs in WinPack and Print Cache and should be available by the time you read this.

Hurricane 2.0 for Windows 95 is the first utility to deliver on the promise of RAM compression without performance penalties. All in all, Hurricane 2.0 boasts some very impressive technology in a well-designed and affordable package. **Hurricane 2.0.** Street price: \$50. Requires: 4MB RAM, 2MB hard disk

COCKPIT CONTROLS: WinGauge is a comprehensive Windows resource meter.



and reap a major performance boost. As a result, Helix Software's \$50 Hurricane 2.0 for Windows 95, a utility that promises to stretch system memory, no longer seems so appealing. Yet Hurricane 2.0 is an impressive utility that delivers some worthwhile enhancements.

NO PERFORMANCE PROBLEMS

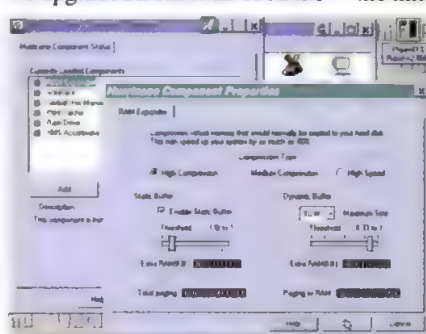
The big news is that Hurricane 2.0 is the first software utility that expands usable memory without a performance hit. Hurricane 1.02, an Editors' Choice winner ("Windows 3.1 Memory Enhancement Utilities," February 20, 1996) speeded up Windows 3.x by providing virtually unlimited Windows resources. Hurricane 2.0 provides all the benefits of Hurricane 1.02 and more, with Windows 95-specific functionality and a much-improved interface that eliminates most of the end-user tweaking. Hurricane 2.0 finds and uses unused RAM in your system under Windows 95, and when coupled

640-by-480 with 256 colors requires 300K of video memory; but most video cards have at least 1MB on board, leaving about 720K free for the taking by Hurricane's RAM Expander utility.

Hurricane uses two buffers to perform its memory magic. Static Buffer accesses video memory and smaller regions in system RAM not normally used for software. If Hurricane is unable to access video memory, it doesn't bother with the unused system RAM. To justify the performance hit caused by compressing and decompressing data, Hurricane sets a minimum threshold for compressibility, a ratio of at least 1.18:1. According to Helix, the data that ends up in the static buffer is compressed to a ratio of about 3:1. This extra memory is used as virtual memory, which is accessible far faster than virtual memory stored on the hard disk.

The Dynamic Buffer uses physical memory for its compression, but the threshold compression ratio is set to 8.33:1 to offset the performance hit from Windows' increased paging activity.

RAM and 2MB of video memory, running at 1,024-by-768 with 256 colors—increased from 21.5 to 26.2 when Hurricane's features were installed, a 22 percent boost. While impressive, that increase couldn't match the results of increased system memory. When we upgraded from 8MB of RAM



RAM EXPANDER: Hurricane uses two buffers to access unused video memory and squeeze more out of system memory.

to 16MB, we saw a massive increase in performance—largely because of the fast Pentium/150 CPU. But older systems with slower processors should be obvious platforms for Hurricane, especially since you might not want

space, Microsoft Windows 3.1 or later, or Windows 95. Helix Software Co., Long Island City, NY; 800-451-0551, 718-392-3100; fax, 718-392-4212; www.helixsoftware.com. **Circle 404** on reader service card.



January 1996 • P133 PowerServer SMP



January 1996 • Millennium Line



January 1996 • Millennium P133



January 1996 • Millennium P120



January 1996 • Millennium P100



February 1996 • Home MPC Pro



January 1996 • Millennium P133



January 1996 • Millennium P120



February 1996 • Millennium P133



February 1996 • Millennium P133



February 1996 • Millennium P120



February 1996 • Millennium P100



February 1996 • Home MPC Pro



March 1996 • Millennium P120



April 1996 • Millennium Plus P166



April 1996 • Millennium Plus P166



April 1996 • Millennium P133



April 1996 • Millennium P133



April 1996 • Millennium P133



April 1996 • Millennium P133



April 1996 • Millennium P133



June 1996 • Millennium P166



April 1996 • Millennium P166



July 1996 • Millennium Plus P166



June 25, 1996 • Millennium P133



June 25, 1996 • Millennium P133



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Superior technology at attractive prices has made the Micron Millennia™ name the people's choice—and the Editors' Choice —again and again.



NOW YOU GET TWICE THE MEMORY IN SELECTED SYSTEMS! (SEE CONFIGURATIONS)



With our legacy of memory and manufacturing expertise, Micron has just doubled memory in several systems (see configurations). We've added other powerful enhancements to give you a vast increase in system capacity.

MILLENNIA™ P166

- Intel 166MHz Pentium® processor
- 512KB pipeline burst cache, flash BIOS
- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- **PCI 64-bit 3D video, MPEG, 4MB EDO**
- Tool-free minitower or desktop
- Microsoft® Mouse, 104-key keyboard
- Microsoft Windows® 95 & MS® Plus! CD
- 5-year/3-year Micron Power™ warranty

- **16MB EDO RAM** • 1.2GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Works 95 CD

\$1,999 Business lease \$4M/month

- **32MB EDO RAM** • 2.1GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Office Pro 95 & Bookshelf® 95 CDs

\$2,399 Business lease \$4.2M/month

- **64MB EDO RAM** • 3.1GB EIDE hard drive
- 17" Micron 17FGx, .26dp (15.8" display)
- Microsoft Office Pro 95 & Bookshelf 95 CDs

\$3,149 Business lease \$10.2M/month

- With 133MHz Pentium processor.....subtract \$200
- With 200MHz Pentium processor.....add \$100

MILLENNIA™ P200 PLUS

- Intel 200MHz Pentium processor
- 512KB pipeline burst cache, flash BIOS
- PCI 32-bit Ultra SCSI Fast-20 controller
- 8X SCSI CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- **PCI 64-bit 3D video, MPEG, 4MB EDO**
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 & MS Plus! CD
- 5-year/3-year Micron Power warranty

- 16MB EDO RAM • 1GB Fast SCSI-2 hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Works 95 CD

\$2,499 Business lease \$5M/month

- 32MB EDO RAM • 2GB Fast SCSI-2 hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Office Pro 95 & Bookshelf 95 CDs

\$3,199 Business lease \$10.9M/month

- 64MB EDO RAM • 4GB Fast SCSI-2 hard drive
- 17" Micron 17FGx, .26dp (15.8" display)
- Microsoft Office Pro 95 & Bookshelf 95 CDs

\$4,249 Business lease \$14M/month

- With 166MHz Pentium processor.....subtract \$100

HOME MPC™ P133

- Intel 133MHz Pentium® processor
- 256KB pipeline burst cache, flash BIOS
- **16MB EDO RAM** • 1.2GB EIDE hard drive
- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- 28.8 fax/modem, speakerphone, voice mail
- Microsoft® Phone telephony software
- Internet ready: Internet in a Box from CompuServe®/Spry Internet Explorer
- Prodigy®, America Online® & CompuServe trial memberships
- PCI 64-bit 3D video, MPEG, 2MB EDO
- 15" Micron 15FGx, .28dp (13.7" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows® 95 & MS® Plus! CD

- Quicken® Financial Pak includes: Quicken Deluxe 5.0; Quicken Financial Planner; Quicken Parents' Guide to Money; Quicken Family Lawyer™
- Microsoft Home Pak includes: Works 4.0 for Windows 95; Publisher Deluxe for Windows 95; Encarta® 96; Encarta 96 World Atlas; Music Central® 96; Wine Guide; Arcade 1.0; Scenes—Sports Extremes Collection; Cinemania® 96; Julia Child Home Cooking; Best of Windows Entertainment Pack; CD Sampler (including Fury! game demo)

- 5-year/3-year Micron Power™ warranty

\$1,999

- With 166MHz Pentium processor.....add \$200

HOME MPC™ P200

- Intel 200MHz Pentium processor
- 256KB pipeline burst cache, flash BIOS
- **32MB EDO RAM** • 2.1GB EIDE hard drive
- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit 3D WaveTable stereo sound card
- Advent AV270 2x25 watt stereo speakers
- 28.8 fax/modem, speakerphone, voice mail
- Microsoft Phone telephony software
- Internet ready: Internet in a Box from CompuServe/Spry Internet Explorer
- Prodigy®, America Online & CompuServe trial memberships
- PCI 64-bit 3D video, MPEG, 2MB EDO
- 15" Micron 15FGx, .28dp (13.7" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 & MS Plus! CD
- Microsoft Office Pro 95 & Bookshelf® 95 CDs

- Quicken Financial Pak includes: Quicken Deluxe 5.0; Quicken Financial Planner; Quicken Parents' Guide to Money; Quicken Family Lawyer
- Microsoft Home Pak includes: Works 4.0 for Windows 95; Publisher Deluxe for Windows 95; Encarta 96; Encarta 96 World Atlas; Music Central 96; Wine Guide; Arcade 1.0; Scenes—Sports Extremes Collection; Cinemania 96; Julia Child Home Cooking; Best of Windows Entertainment Pack; CD Sampler (including Fury! game demo)

- 5-year/3-year Micron Power warranty

\$2,899

- With 166MHz Pentium processor.....subtract \$100



January 9, 1996
Millennia P166

June 28, 1996
Millennia P200

June 28, 1996
Millennia P166

August 1996
Millennia P133

May 30, 1995
Millennia P120

May 16, 1995
Home MPC P100

January 1996
Millennia P133

April 1996
Millennia P166

Jan 1996
Millennia P166

January 1996
PowerServer SMP P133

June 1996
Millennia P166

May 1996
Home MPC P133

December 1995
Millennia P133

Micron brings super high-tech manufacturing to the PC factor floor. Recently, we've invested millions of dollars to build the most advanced PC manufacturing facility possible.



Outstanding Performance—Don't Take Our Word for It.

Talk is cheap when you're speaking for yourself. But when it's from the mouth of an industry expert, it carries weight. Here are a few of many examples of what they're saying about Micron PCs:

Micron Home MPC "... the fastest we've ever tested ... as well as a marvelous family package ... it wins our Top Rated award. ..." —*Family PC*, May 1996

Micron Millennia "In short, Micron covers all the bases with this Best Buy." —*PC World*, March 1996

Micron PowerServer "This is definitely a best buy." —*Computer Shopper*, January 1996

Micron Millennia TransPort "... nearly a dead ringer for IBM's ThinkPad ... but performs better and saves you about \$2,500." —*PC Magazine*, April 1996

The Right System for You

Micron makes a suite of outstanding solutions designed for the way you work or play. From home systems to servers, desktop PCs to portable multimedia solutions, Micron always comes through with a system built to satisfy. For details and prices, turn the page.

**Micron Power**

Warranty & Support

- 5-year limited warranty on microprocessor and main memory
- 3-year limited parts-only system warranty
- 1-, 3- or 5-year optional on-site service agreement for Micron desktop and server systems
- 30 days of free Micron-supplied software support for Micron desktop systems; 3 free network operating system incident resolution calls for Micron server systems
- 30-day money-back policy
- 24-hour technical support

The foregoing is subject to and qualified by Micron's standard limited warranties and terms and conditions of sale. Terms and conditions of sale may vary for specific configurations. Copies of the limited warranties may be obtained on our Web site or by calling Micron.

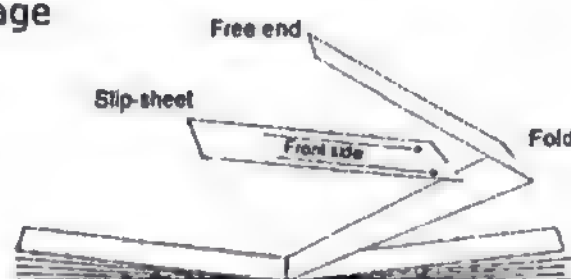


MICRONTM
ELECTRONICS, INC.

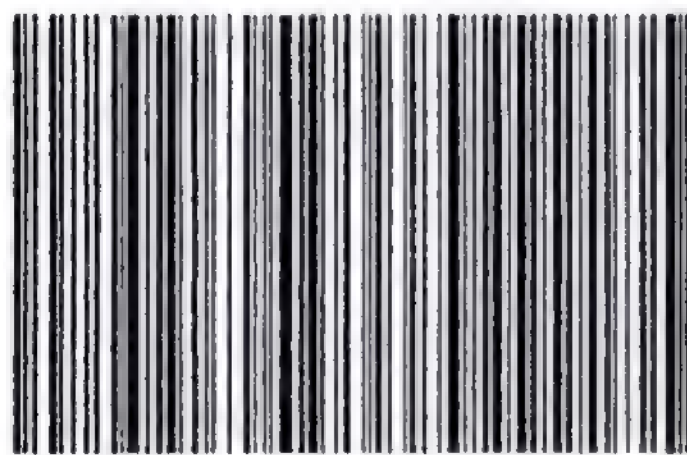
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<http://www.mei.micron.com>

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet



Inverted Foldout slip-sheet

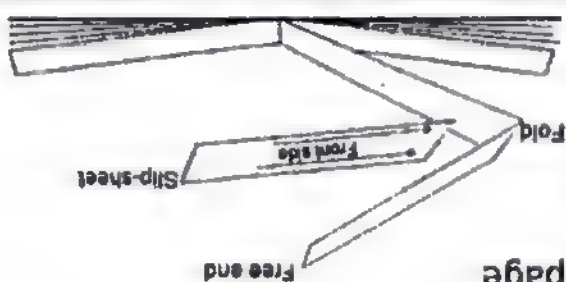
Folded edge of the page

1. Open the foldout page
2. Insert this sheet with

1. Front side touching the free page
2. Arrow pointing to the fold

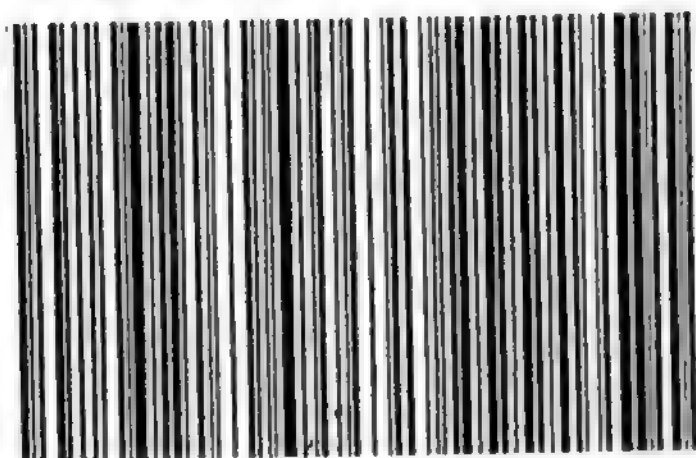
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



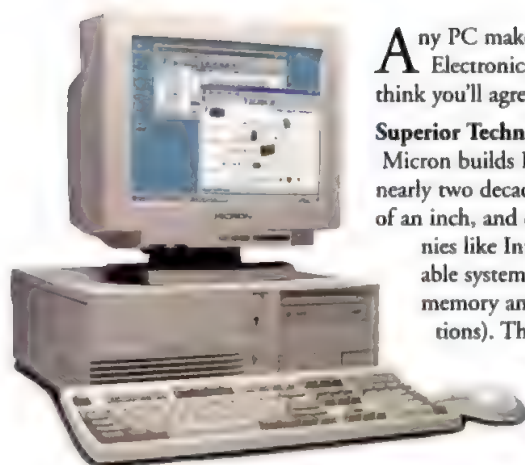
GbsSlipBack-001B

Back

1. Follow instructions on the other side



SUPERIOR SOLUTIONS BY DESIGN



Any PC maker can claim to offer a solution that covers your needs. But at Micron Electronics, we prefer to let our history and our products speak for themselves. We think you'll agree it's an impressive story.

Superior Technology—A Micron Tradition

Micron builds PCs with a legacy of excellence. Our manufacturing processes grew out of nearly two decades in the semiconductor business, where precision is measured in millionths of an inch, and quality in parts per million. We've built strategic relationships with companies like Intel, Microsoft and Novell. From this solid background, we're forging unbeatable systems you can count on today and tomorrow. Best of all, we just doubled our memory and added powerful enhancements to several of our systems (see configurations). This industry-leading approach gives you a vast increase in system capacity.

Award-Winning Products

In the past two years, leading industry publications have applauded Micron PCs with more than 140 awards for product performance, customer service and support. This includes *PC Magazine* Best Products of

1995 and Editors' Choice awards in several categories. Add more than 40 *PC World* Best Buy awards and you've got an impressive technology hall of fame. In fact, just this summer, Micron has won three *PC Magazine* Editors' Choice® Awards for Millennia™ desktop and Millennia TransPort™ notebook computers—an unprecedented achievement for Micron.

Recognized Service and Reliability

After your purchase, the story continues. Just ask *PC Magazine* readers. They bestowed on us the coveted Readers' Choice for Customer Service and Reliability in 1994 and 1995. And *PC World* recently awarded us first tier status along with the likes of Apple, Compaq, Digital and HP. Pretty good company, wouldn't you say?



Micron Power™ Warranty—An Industry First

We support our reliability promise with the industry-leading Micron Power warranty. It backs the microprocessor and main memory for five years, an industry first. Add a three-year, parts-only system warranty and a 30-day money-back guarantee, and you can rest assured that you're in good hands.

RELIABILITY RANKING

1ST TIER

APPLE COMPAQ **MICRON** DIGITAL DELL/EMERSON

2ND TIER

AST D. IOTA NEC

3RD TIER

ACER EMERSON 2000 EMERSON 2000 EMERSON 2000

Source: *PC World Reliability & Service Monitor*, May 20 - November 20, 1995

MILLENNIA TRANSPORT™ P133



- 133MHz Mobile Intel Pentium® processor
- Intel 430MX PCI chipset
- 256KB L2 pipeline burst cache
- 16MB EDO memory (48MB max.)
- 8X modular CD-ROM drive
- PCI graphics accelerator, 1MB EDO memory
- Pick-a-Point™ dual pointing devices integrate both pointing stick and touchpad
- Removable EIDE hard drive (1.2GB max.)
- 3.5" modular floppy drive
- Intelligent modular lithium-ion battery
- 16-bit stereo sound
- Built-in stereo speakers and microphone
- 2 Type II or one Type III PCMCIA slots
- S-Video and NTSC video outputs
- Headphone, microphone and line-in jacks
- 2 infrared ports, one front, one back
- Parallel, serial, VGA and 2 PS/2 ports
- Dimensions: 11.7" x 9.4" x 2.0", Weight: 6.9 lbs.
- Nylon carrying case
- Microsoft® Windows® 95 and MS® Plus! CD
- Microsoft Office Pro 95 and Bookshelf® 95 CDs
- Kensington™ security lock
- 5-year/3-year Micron Power™ limited warranty

† 6.9 lbs. includes 3.5" floppy and one battery
 †† Lock secures both Millennium Transport and MicronDock



AUGUST 1998
 MILLENNIA TRANSPORT P133

- 16MB EDO memory (48MB max.)
- 12.1" active matrix display, 800 x 600
- 1.2GB removable hard drive

\$4,399 Business lease \$150/month

- 32MB EDO memory (48MB max.)
- Motorola® Montana 28.8 fax/modem
- 12.1" active matrix color display, 800 x 600
- 1.2GB removable hard drive
- 2nd lithium-ion battery

\$5,199 Business lease \$163/month

OPTIONS

- With 150MHz Pentium processoradd \$200
- With Motorola Montana 28.8 fax/modem.....add \$299
- With 3Com® Ethernet 10BT PCMCIAadd \$149
- With Samsonite® leather carrying caseadd \$99
- With 2nd modular lithium-ion battery.....add \$199
- With 2nd 1.2GB hard drive.....add \$599
- With 2nd 2.0GB hard drive.....add \$699
- With 16MB DIMM module upgrade.....add \$349
- With 32MB DIMM module upgrade.....add \$749
- MicronDock™ multimedia port replicatoradd \$299
- MicronExec™ desktop packageadd \$799

POWERSERVER SMP-N P133

- Intel 133MHz Pentium® processor
- Dual Pentium SMP ZIF sockets
- 512KB write-back cache, flash BIOS
- Slots: 5 EISA, 2 PCI, 1 EISA/PCI
- Adaptec PCI 32-bit Ultra SCSI Fast-20 controller
- 8X SCSI-2 CD-ROM drive
- 3.5" floppy drive
- 64-bit 1MB ISA video
- 3Com® 3C595 PCI 10/100 Ethernet NIC
- Full-size tower with 10 drive bays
- Microsoft® Mouse, 104-key keyboard
- Novell® NetWare 4.1 (5 user license)
- NOS support (3 free resolutions)
- 5-year/3-year Micron Power™ warranty

- 16MB RAM • 1GB SCSI-2 hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

\$3,999 Business lease \$136/month

- 32MB RAM • 2GB Ultra SCSI hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

\$4,799 Business lease \$163/month

POWERSERVER SMP-N P266

- Dual 133MHz Pentium processors
- 512KB write-back cache, flash BIOS
- Slots: 5 EISA, 2 PCI, 1 EISA/PCI
- Adaptec PCI 32-bit Ultra SCSI Fast-20 controller
- 8X SCSI-2 CD-ROM drive
- 3.5" floppy drive
- 64-bit 1MB ISA video
- 3Com® 3C595 PCI 10/100 Ethernet NIC
- Full-size tower with 10 drive bays
- Microsoft® Mouse, 104-key keyboard
- Novell® NetWare 4.1 (5 user license)
- NOS support (3 free resolutions)
- 5-year/3-year Micron Power™ warranty

- 32MB RAM • 2GB Ultra SCSI hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

\$4,999 Business lease \$178/month

- 64MB RAM • 4GB Ultra SCSI hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

\$5,899 Business lease \$185/month



MILLENNIA™ PRO200

- Intel 200MHz Pentium® Pro processor
- 256KB internal cache, flash BIOS
- 8X EIDE CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- PCI 64-bit 3D video, MPEG, 4MB EDO
- Tool-free minitower or desktop
- Microsoft® Mouse, 104-key keyboard
- Microsoft Windows NT® Workstation CD or Windows® 95 & MS® Plus! CD
- 5-year/3-year Micron Power™ warranty

- 16MB EDO RAM • 1.2GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Works 95 CD

\$2,399 Business lease \$82/month

- 32MB EDO RAM • 2.1GB EIDE hard drive
- 17" Micron 17FGx, .26dp (15.8" display)
- Microsoft Office Pro 95 & Bookshelf® 95 CDs

\$3,049 Business lease \$104/month

MILLENNIA™ PRO200 PLUS

- Intel 200MHz Pentium Pro processor
- 256KB internal cache, flash BIOS
- PCI 32-bit Ultra SCSI Fast-20 controller
- 8X SCSI CD-ROM drive, 3.5" floppy drive
- 16-bit stereo sound & speakers
- PCI 64-bit 3D video, MPEG, 4MB EDO
- Tool-free mini-tower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT Workstation CD or Windows 95 & MS Plus! CD
- Microsoft Office Pro 95 & Bookshelf 95 CDs
- 5-year/3-year Micron Power warranty

- 32MB EDO RAM • 2GB Fast SCSI-2 hard drive
- 15" Micron 15FGx, .28dp (13.7" display)

\$3,499 Business lease \$119/month

- 64MB EDO RAM • 4GB Fast SCSI-2 hard drive
- 17" Micron 17FGx, .26dp (15.8" display)

\$4,549 Business lease \$155/month

- 128MB EDO RAM • 9GB Fast SCSI-2 hard drive
- 21" Micron 21FGx, .26dp (20.0" display)

\$7,649 Business lease \$240/month

CLIENTPRO™ P100

- Intel 100MHz Pentium® processor
- 256KB pipeline burst cache, flash BIOS
- 3Com® 3C509 Combo network adapter
- 3.5" floppy drive
- Tool-free minitower or desktop
- Microsoft® Mouse, 104-key keyboard
- MS-DOS® 6.22/Windows® for Workgroups 3.11
- 5-year/3-year Micron Power™ warranty

- PCI 64-bit graphics accelerator (2MB EDO)
- 8MB EDO RAM • 1.2GB EIDE hard drive
- 14" Micron 14FGx, .28dp (12.9" display)
- Microsoft Works preinstalled

\$1,499 Business lease \$51/month

- PCI 64-bit graphics accelerator (2MB EDO)
- 16MB EDO RAM • 2.1GB EIDE hard drive
- 15" Micron 15FGx, .28dp (13.7" display)
- Microsoft Office Pro 4.3 preinstalled

\$2,018 Business lease \$69/month

- With 133MHz Pentium processor.....add \$100

CLIENTPRO™ P200

- Intel 200MHz Pentium processor
- 256KB pipeline burst cache, flash BIOS
- 3Com 3C509 Combo network adapter
- 32MB EDO RAM • 3.1GB EIDE hard drive
- 3.5" floppy drive
- 8X EIDE CD-ROM drive
- PCI 64-bit graphics accelerator (2MB EDO)
- 17" Micron 17FGx, .26dp (15.8" display)
- Tool-free minitower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows NT® Workstation
- Microsoft Office Pro 95 & Bookshelf® 95 CDs
- 5-year/3-year Micron Power warranty

\$3,257 Business lease \$111/month

- With 166MHz Pentium processor.....subtract \$100



Microsoft Windows NT Workstation 3.51 or 4.0 available on selected configurations.

International Sales 208-893-8970 International Fax 208-893-7393

Tollfree from Puerto Rico 800-708-1756

Tollfree from Canada 800-708-1758

Tollfree from Mexico 95-800-708-1755

• 900 E. Karcher Road, Nampa, ID 83687
 • Mon-Fri 6am-10pm Sat 7am-5pm (MT)
 • International Sales Hours: Mon-Fri 6am-7pm (MT)
 • 208-893-3434 • Fax 208-893-3424
 • Purchase Order Fax 208-893-8992
 • GSA Contract #GS35F4317D
 • Technical Support Available 24 Hours A Day-7 Days A Week
 • Technical Support E-mail: techsupport.mei@micron.com

MICRON™
 ELECTRONICS, INC.

800-707-2329

<http://www.mei.micron.com>

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Make a Great PC Even Better!

Custom configure your new Micron system with these popular options.

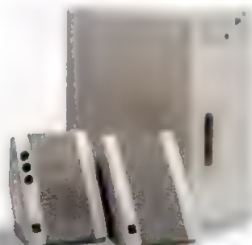
MULTIMEDIA OPTIONS

- 16-bit 3D Waveable stereo sound.....\$59*
- 16-bit 3D Waveable stereo soundcard w/2MB RAM.....\$99*
- Advent AV270 Powered Partners stereo speakers.....\$99
- Advent AV370 Powered Partners stereo speakers w/subwoofer.....\$199
- Microsoft® SideWinder™ 3D Pro joystick.....\$59



Microsoft

WHERE DO YOU WANT TO GO TODAY?



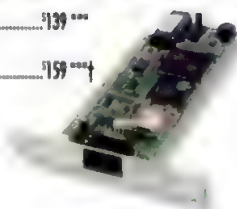
STORAGE/MEDIA OPTIONS

- Adaptec 2940U Ultra SCSI Fast-20 controller.....\$100
(upgrade from system with standard Ultra SCSI Fast-20 controller)
- Plextor 8Plex 8X 1.2MB/5 SCSI internal CD-ROM drive.....\$200**
(upgrade from systems with standard 8X EIDE CD-ROM drive)
- Iomega Jaz SCSI drive with 1.0GB removable cartridge.....\$399**
- Iomega Zip IDE drive with 100MB removable cartridge.....\$99
- Iomega Ditto 800 (400/800MB) Travan Tape back up w/tape.....\$149
- Iomega Ditto 3200 (1.6/3.2GB) Travan Tape back up w/tape.....\$199
- Sony 4/8GB DDS-2 DAT SCSI Tape back up w/tape.....\$999**



COMMUNICATION OPTIONS

- 28.8kb V.34 internal data/fax modem.....\$139***
- 28.8kb V.34 internal telephony data/fax modem.....\$159***†
w/full duplex speakerphone and voice mail



NETWORKING OPTIONS

- 3Com® 3C509 Ethernet ISA NIC (BNC, AUI & RJ-45).....\$99
- 3Com 3C595 Fast Etherlink PCI 10/100 NIC (RJ-45 only).....\$159
- SMC ISA TokenCard network card.....\$199

- * Upgrade from systems with standard 16-bit stereo sound card
- ** Requires SCSI Host Adapter
- *** V.34 modem includes trial memberships to CompuServe®, Prodigy® and America Online®
- † Requires sound card
- †† Upgrade from systems with standard Micron 17" 17FGx color monitor
- ††† Upgrade from systems with standard 64-bit 2MB video card

Options and accessories available with systems purchase only.

QUICKEN® FINANCIAL PAK

- Quicken Financial Pak, including: Quicken Deluxe 5.0; Quicken Financial Planner™; Quicken Parents' Guide to Money™; Quicken Family Lawyer™.....\$69

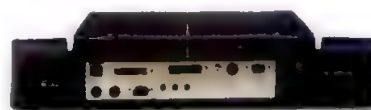


DISPLAY/VIDEO OPTIONS

- 17" Hitachi SuperScan 1711 (15.9" display) 26dp color monitor.....\$150 ††
- 21" Hitachi SuperScan 2111 (20" display) 26dp color monitor.....\$1,050 ††
- Diamond Stealth64 video card w/2MB VRAM.....\$150 †††
- Diamond Stealth64 video card w/4MB VRAM.....\$300 †††
- 49 Imagine 128 series II video card w/4MB VRAM.....\$500 †††
- 49 Imagine 128 series I video card w/8MB VRAM.....\$750 †††

MILLENNIA TRANSPORT™ OPTIONS

- MicronDock™ multimedia port replicator: Ethernet LAN adapter, SCSI-2port, S-Video and NTSC video output, built-in stereo speakers, infrared port, headphone, microphone, line-in jacks, parallel, serial, VGA and 2 PS/2 ports.....\$299
- MicronExec™ desktop package: Matching black 17" monitor (15.8" display) with matching black mouse, mousepad and keyboard (can be used with or without MicronDock).....\$799
- Motorola Montana 28.8 fax/modem supports regular telephone connections, cellular phones and two-way paging devices.....\$299



SERVICE OPTIONS

- Extended 2-year on-site service coverage for desktop systems.....\$99
(upgrade from optional 1-year on-site service coverage)
- Extended 3-year on-site service coverage for desktop systems.....\$139
(upgrade from optional 1-year on-site service coverage)
- Complete on-site PC installation (call Micron for details).....\$159

OTHER OPTIONS

- APC® PowerLine surge suppressor.....\$39
- APC Pro77 surge suppressor.....\$59
- Microsoft Natural Keyboard®.....\$49
(upgrade from standard keyboard)

- 980 E. Karlov Blvd., Memphis, TN 38167
- Mon-Fri 9am-10pm Sat 7am-5pm (MT)
- International Sales Hours: Mon-Fri 9am-7pm (MT)
- 208-893-3434 • Fax 208-893-3424
- Purchase Order Fax 208-893-8992
- ESA Contract #653343170
- Technical Support Available 24 Hours A Day-7 Days A Week
- Technical Support E-mail: techsupport@micron.com

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800-707-2329
<http://www.mei.micron.com>

DATA STORAGE

Online Storage Services Provide A Virtual Vault for Your Data

By James Karney

Should the Internet be your backup device? McAfee Personal Vault and Surefind, which is offered through CompuServe, are new services for backing up your PC over the Internet. MCI and Xact Labs will soon offer their own online backup solutions. These new services, which begin at about \$10 per month, are unlikely to put tape drives on the endangered hardware list, but they do offer some key advantages, including random access and the security and convenience of keeping your most valuable data off-site.

Both Personal Vault's client software, called WebStor, and Surefind run under Microsoft Windows and use an Explorer-like interface for selecting files. Wizards walk users through setting up sessions, configuring connections, and scheduling automatic backups. In addition, both applications compress and encrypt data, require passwords to access the host or restore files, and keep logs of backup sessions.

SUREFIND

The online equivalent of a safe deposit box, Surefind offers iron-

account to cover the cost of restoring any lost data.

To get started, all you need is the Surefind software and a modem, but you must dial in using the CompuServe network. Pricing for Surefind varies depending on how much you use it. The basic plan is free for the first month and costs \$9.95 a month thereafter. You can store up to 100MB, with weekly backups of 5MB each. Additional space costs 50 cents per megabyte, and each recovery costs 50 cents after a \$5 minimum.

Computer novices beware: Online backup is still a work in progress. Installing and backing up files with Surefind was easy but not without problems. Our Windows 95 test-bed had a Pentium/133 CPU, 40MB of RAM, and a Hayes Optima V.34 modem. It took about 10 minutes to install Surefind, define a backup session, and identify the 180 text and graphics files totaling 10MB to be stored. The transfer of data from our PC to the Surefind server took about 26 minutes.

Although the backup part of the job went without incident, we had to overwrite the existing file while restoring; several attempts to place the remote copy in a new directory on our hard drive failed. Recovering the file took less than a minute, although Surefind warns that accessing the right jukebox disk can take up to 4 minutes.

Another hassle arose when we tried to log onto CompuServe with WinCIM after installing Surefind. It had replaced

CompuServe's WINSOCK.DLL with a Spy version, blocking our log-on.

Surefind is not without its quirks, but if you want a guaran-

tee that your files will always be there, it's the ticket.

Surefind. List price: Basic plan, first month free, \$9.95 per month thereafter. Requires: 4MB RAM, 5MB hard disk space, Microsoft Windows 3.x or Windows 95. Surefind Information Inc., Pittsburgh, PA; 800-787-0009, 412-788-

utes.; make sure you have all the FTP server information on hand before you start. Transfer time for our test 10MB session varied from 23 to 31 minutes. We also created a local backup on our Windows NT Server, which allowed us to add individual files by simply dropping them in the WebStor workspace.



EASY STORAGE: Surefind's Explorer-like interface has clear descriptions, and it's simple to use.

2511; www.surefind.com. Circle 402 on reader service card.

McAfee Personal Vault

If Surefind is like a bank account, then McAfee Personal Vault and its WebStor software are like an armored truck. Personal Vault's basic plan includes unlimited access 24 hours a day, and, unlike Surefind, WebStor does not limit you to moving files between your PC and the online vault. You can use a local or LAN drive as a repository as well as any TCP/IP server that allows FTP transfers.

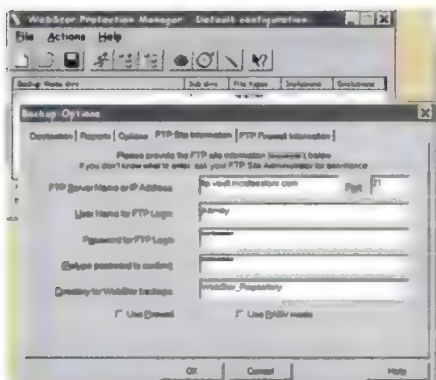
If you want to use McAfee's remote storage, make sure you understand Internet and FTP basics first. For \$65, you can download the WebStor application from the company's Web site and open a Personal Vault account at the same time. The home page and links need some work, and navigating requires a bit of searching. Sending files to McAfee's server requires an active Internet connection. McAfee's pricing plan is simple: \$10 per month for up to 30MB, with unlimited access.

Configuring WebStor for local or network use takes about 5 min-

utes. Along with WebStor, McAfee provides another app—ImageStor—that writes an image of an entire disk to a compressed file. Given the storage fees for online vaulting, however, you may want to keep global backups on tape. **McAfee Personal Vault.** List price: \$10 per month; software, \$65. Requires: 8MB RAM, 4MB hard disk space, 14.4-Kbps modem or faster, Microsoft Windows 95 or Windows NT. McAfee Associates Inc., Santa Clara, CA; 800-332-9966, 408-988-3832; www.mcafee.com. Circle 403 on reader service card.

Besides providing secure off-site storage, online backup services also allow roving laptop users to get easy access to their data while on the road. But given the performance problems and pricing, most people will probably use such services only for specific files. And until these services become more well established, you might want to keep a local backup just in case.

At present, the two major areas that give us pause are the lack of antivirus scans and the speed—or more precisely, the lack of it.



NET-ENABLED: McAfee's WebStor can use any available FTP site as a repository, but its interface can be difficult to use.

clad security and confidentiality, and it's backed by a hefty guarantee. The company promises to pay up to \$100,000 per customer

PROGRAMMING

Multimedia Authoring at the Click of a Mouse

By Stephen W. Plain

Occasionally a product comes along that redefines a software category. Corel Click & Create is just such a product. The \$695 program merges traditional multimedia authoring with game development to create a unique development environment for building highly interactive games, screen savers, multimedia presentations, and kiosk applications. This code-free tool is flexible and a good fit for all levels of expertise.

The key to Click & Create is its wealth of sample media and context-sensitive interface. The package comes with thousands of clip-art images, video clips, animations, sounds, and transitions. In addition, there are more than 100 Click & Create libraries, including all sorts of graphics and other media ranging from professional-looking presentation backgrounds to animated monsters for action games.

The interface consists of four major windows: Storyboard Editor, Frame Editor, Event Editor, and Time Line. Presentation developers will likely spend most of their time with the Storyboard Editor, which displays a thumbnail of each frame, along with passwords, transitions, and resolution settings. The Frame Editor lets you work with frames and their objects.

Click & Create lets you create morphing sequences and up to 16 animation sequences for each active object. You have precise control over paths, speed, acceleration, and looping parameters. Click & Create can import more than 30 graphics file types, as well as .AVI, .FLC, .FLI and Quick-time animation sequences.

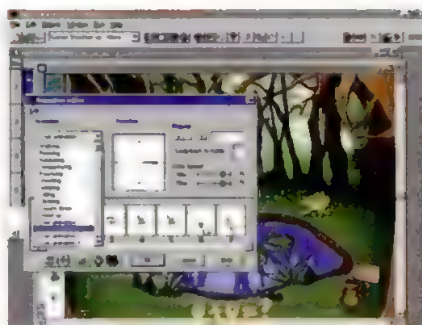
Click & Create lets you define actions in the context of your application rather than in a coding language. A feature called the Step-Through Editor runs your application and pauses at each event to prompt you for a response. For example, the Step-Through Editor might prompt you

with a message such as "Bullet is colliding with monster" and let you specify that a sound file be played and the monster destroyed.

What this really does is create a new event condition in the Event Editor, which helps you compile a grid of events with English descriptions. The Event Editor makes the development process downright fun.

Click & Create includes such fundamental game objects as players, scoring, joysticks, and lives objects, and WinG and DirectDraw support. It lets you save your application as a 16-bit or 32-bit executable or as a screen saver.

On both our test-beds, a Pen-



GUI GAME BUILDER: Click & Create lets you build up to 16 separate animation sequences for each object and edit frame by frame.

tium/133 PC and a 486DX2/66 PC, we found performance to be surprisingly snappy.

We had only a couple of minor complaints. The product's help content was rather weak, but there were several excellent sample applications. Although you can distribute your applications royalty-

free, the distribution agreement requires that you send the applications to Corel for approval.

We were wowed by Click & Create. This revolutionary tool breaks down the wall between programmers and content creators, and it opens up the multimedia and game development process to anyone with a bit of creativity.

Corel Click & Create. List price: \$695. Requires: 4MB RAM (8MB recommended), 12MB hard disk space, Microsoft Windows 3.1 or later, Windows 95, or Windows NT. Corel Corp., Ottawa, Ontario, Canada; 800-772-6735, 613-728-8200; www.corel.com. Circle 405 on reader service card.

HOME AUTOMATION

Aptiva's Home Director Pushes All the Right Buttons

By Bill Howard

George Jetson, meet your new home-automation PC. Part of IBM's Aptiva line of desktop PCs, the Home Director models each serve as a remote command center for triggering your indoor and outdoor lights, starting the coffee maker in the morning, and even turning on the sprinklers or opening your garage door.

The Home Director software uses the widely established X-10 signaling scheme, which sends

coded pulses over ordinary electrical lines to a \$15 receiver connected to a single light or appliance. To send the pulses over your home's electrical system, you connect the Aptiva PC to a wall outlet via the serial-port device and a small interface box. You can use Home Director's scheduler to trigger activities at preappointed times, control lights and appliances in real time from the Aptiva PC, or use a hand-held remote or telephone to activate the receivers.

Windows-based software developed for IBM by X-10 Corp. makes it a breeze to program lights to go on and off multiple times a day, or on at dusk and off at dawn.

Home Director is available on selected Aptiva models sold through Radio Shack—the keeper of the flame for X-10 technology over the past decade. An Aptiva C66 with Home Director, including a

starter pack of two modules, sells for about \$50 more than a comparable Aptiva without Home Director. A Pentium/166 PC with Home Director has a street price of \$2,499. If you want to try remote control without buying a new PC, X-10 (USA Inc., 201-784-9700; www.x10.com) sells a nearly identical CM11A control module and Home Automation and ActiveHome software for about \$50.

Home Director requires your PC to be switched on all the time, but IBM's Rapid Resume feature is one of the best implementations of power-down operation in the industry. You won't have to worry about wearing out your PC or wasting energy.

These are the slickest, most user-friendly implementations of X-10 controllers yet.

IBM Aptiva C66 with Home Director. Street price: With Pentium/166 CPU, 16MB RAM, 2GB hard disk, 8X CD-ROM drive, Microsoft Windows 95, master module and two control modules, \$2,499. IBM Corp., Consumer Division, Research Triangle Park, NC; 800-426-7235, ext. 4343; fax, 800-426-4329, ext. 99; www.pc.ibm.com/aptiva. Circle 406 on reader service card.

HOME BASE: Home Director makes it easy to control your lights and appliances from the keyboard.



{ See How Business Travels }

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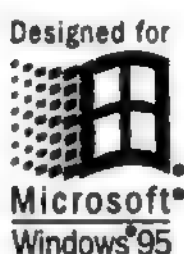
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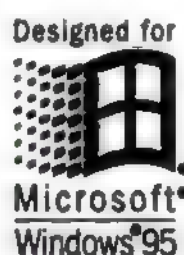
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DATA PROJECTORS

The First Digital Light Processor Projector Reflects Well on InFocus

By Alfred Poor

Mirror, mirror, on the wall, what's the brightest data projector of them all? Active-matrix LCD (AMLCD) projectors have pushed aside the bulkier three-CRT models by offering brighter images in a

tive—in contrast to the transmissive design of AMLCD projectors. The result is that more light is projected from the lamp to the screen. Furthermore, the transistors located in each cell of an AMLCD panel block some of the light, further reduc-

This technology makes the LitePro 620 bright enough for use with normal room lighting. On our tests, the center of an image on a 6-foot-wide screen was 24 foot-candles at the default brightness setting. Compared with the

cated that the lower-right corner was less than a third as bright as the center. In the long term, the system's lamp may prove troublesome. Not only does it run hot, requiring an annoyingly loud fan to cool the sophisticated system, but the lamps are expensive and don't last long as those used in conventional projectors.

The DLP engine design provides other advantages aside from brightness. The use of

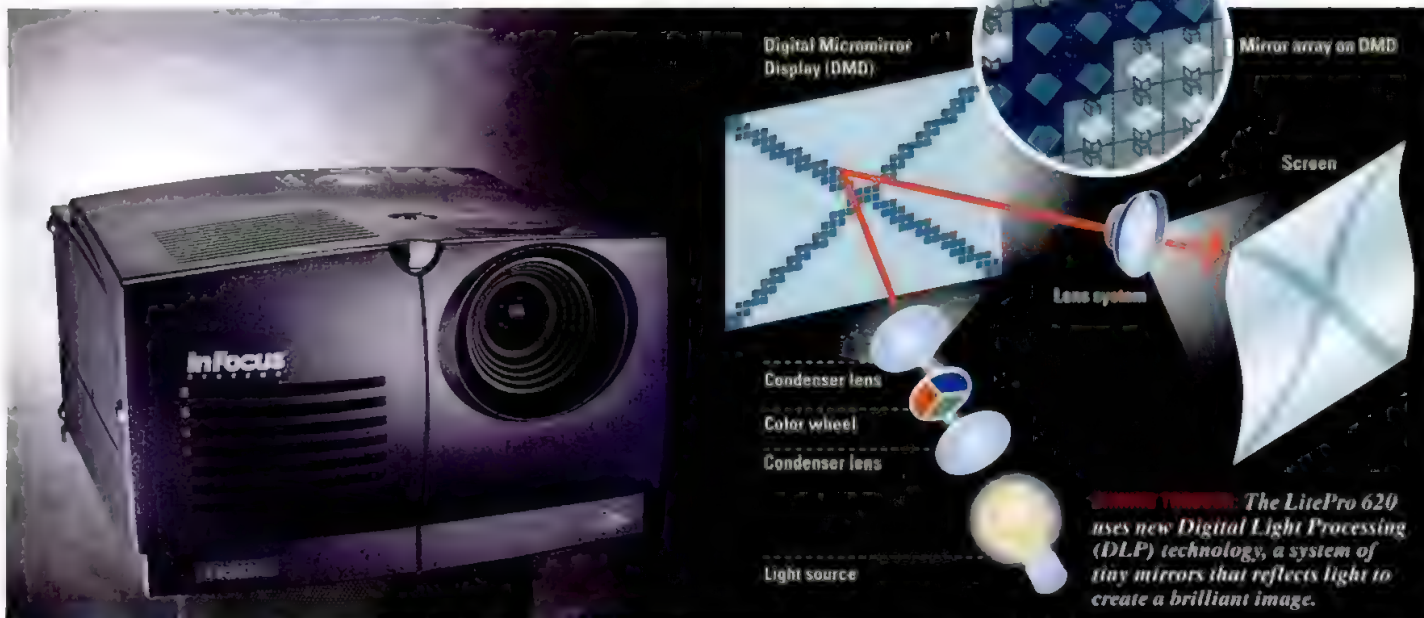


ILLUSTRATION: The LitePro 620 uses new Digital Light Processing (DLP) technology, a system of tiny mirrors that reflects light to create a brilliant image.

smaller, lighter package. Now a new technology threatens to bump AMLCD. The \$10,999 LitePro 620 from InFocus Systems is the first to use the innovative Digital Light Processing (DLP) engine from Texas Instruments, producing brighter and sharper images than its AMLCD competitors.

The key to the projector's advantage is TI's DLP technology, which is essentially a semiconductor chip covered with tiny, square, aluminum mirrors that pivot. Rocking the mirrors in one direction causes a beam of light to be reflected through a series of lenses toward the screen; when pivoted in the opposite direction, the mirrors reflect light away from the lenses. (See illustration.)

This display process is reflect-

ing brightness. Nearly the entire surface of the DLP chip is reflective.

BEYOND VGA

VGA-resolution projectors using DLP technology have been shipping since earlier this year, but the first production Super VGA model is now available from InFocus. The SVGA micromirror chips use more mirrors than the lower-resolution projectors, which means the chip's surface is even more reflective.

InFocus rates its SVGA-resolution LitePro 620 as brighter by one-seventh than their VGA-resolution model. The LitePro 610 produces 350 ANSI lumens, while the higher-resolution LitePro 620 produces 400.

Epson ELP-3300 ("The Top 35 Portable Peripherals," August 1996), a three-panel polysilicon unit and one of the best projector panels, the LitePro 620 is nearly twice as bright. All but the faintest image details were clearly visible even under adverse room-lighting conditions.

The DLP engine uses a spinning color wheel to provide sequential red, green, and blue light for the projector. The LitePro 620 has a control that lets you take the color wheel out of the light path, resulting in a gray-scale image that is even brighter. According to our measurements, the gray-scale image was more than three times as bright as the color image.

The only flaw in image quality is a center that is brighter than the corners; our tests indi-

the color wheel means that each pixel on the display is represented by a single mirror, so there is no halftoning or dithering required. As a result, the images are sharper, and there are no convergence problems (which can be a problem with three-panel designs). The fact that the mirrors nearly cover the entire projector chip surface means that there is almost no screen-door effect, a flaw that can be quite noticeable on an AMLCD in which the cell's image is outlined in black.

EXTRA EFFORTS

InFocus augments the TI display engine with some excellent features of its own. For example, the remote control and the side panel controls have the same button layout, including a

First Looks

convenient mouse pad. Both are illuminated, and the various buttons have different shapes and sizes, making it easier to locate the one you want by touch. In cases where the infrared remote may not work well (such as when the projector is mounted behind a rear-projection screen), a tether wire is provided to pass the signals along.

All adjustments can be made using the on-screen menus. In addition to the standard picture and source controls, you can also configure how you want the projector to handle lower-resolution images. The default is to scale them up to the projector's 800-by-600 resolution, but you can choose to leave them in their original sizes. The excep-

tion is video-source images, which do not get scaled but instead take up about two-thirds of the full-image area.

FEATURES GALORE

Setup is simplified through the use of the InFocus CableWizard, which can quickly be altered for either Macintosh or PC connections. CableWizard has connectors for monitor, graphics adapter, mouse, and sound, and a single 9-foot cable which provides the interface to the projector. A 20-watt JBL amplifier and four-speaker system with surround-sound circuitry provides room-filling audio.

The standard model lists for \$10,999 and comes with both video and data modules. (Video- and data-only models

are also available.) Supported video modes include NTSC, PAL, and SECAM, and the unit has a power supply that handles both 220-volt AC and 110-volt making it practical to use just about anywhere in the world. The projector weighs 24 pounds—which puts it at the intersection of portable and transportable—but it is certainly compact enough to make it practical for travel.

InFocus offers a number of options, but the most tempting one has to be the zoom lens version of the projector, which costs \$11,749. The fixed focal-length lens is easy enough to use, but a zoom feature makes it much easier to adjust the image size to the available screen space instead of

having to move the whole projector. InFocus provides a one-year parts-and-labor warranty on the unit; additional coverage is available at extra cost.

If you're tired of making presentations to a darkened room (which encourages your audience to take short naps), consider the LitePro 620. Its image is big and bold enough to keep your audience awake, and you can even leave the room lights on so your audience can take notes at the same time. It's all done with mirrors, and the final result is pure magic.

LitePro 620. List price: \$10,999. InFocus Systems Inc., Wilsonville, OR; 800-294-6400, 503-685-8888; www.infs.com. Circle 430 on reader service card.

WEB AUTHORIZING

Easy Site: A Web Presence for The Internet-Challenged

By Jan Ozer

If you've been wanting to erect a billboard on the information superhighway but don't know HTML from HTTP, check out the Easy Site Workbook from IMV Internet. For \$39.95 plus \$19.95 per month, in less than a week Easy Site will put together and host a three-page Web site that you design. While the style and look are basic—simple text and graphics on a plain background—it's a great way for small businesses to test the online waters.

You create your Web site using the Easy Site Workbook, which contains simple instructions for developing copy and graphics. Start by choosing among ten style sheets for displaying company information, product specifications, and interactive sheets for placing orders, requesting information, making reservations, and completing online surveys.

PC OR PAPER

Enter your text on one of the included 24 sheets or, for the PC-challenged, just submit printed

copy to IMV Internet. Images can be sent in electronic form on floppy disk or in hard copy; IMV Internet will scan and size them for you. Then IMV Internet creates the page and sends you the password-protected page location so that you can review and edit it.

Most modifications to the pages can be made online. You

can elect to register your site with the top-ten search engines, which costs an extra \$20. You can choose among various report options for the information that the site generates; report costs vary, with some reports costing as much as \$8 per month.

As powerful as Easy Site is, it's not a panacea. IMV Internet is a complete Internet Service provider. It can upgrade your site with such advanced HTML features as frames or register your domain name for you, but that's where it ends. The product

can't handle video, audio, or Java applets.

REAL-WORLD TEST

We tested Easy Site in a real-life scenario. The goal was to bring a Manhattan-based furniture store into the information age by adapting its existing brochure for the Web. It took all of an hour to design a three-page site, complete with pictures and an information request form that can be faxed to the store via IMV Internet when filled out. (Setup for fax service costs \$50, plus \$1.75 per faxed page.)

A company technician walked us through the site-review process, and we went live on the Internet. Although simply having a Web page cannot guarantee that your business will be a success, Easy Site is a pain-free way to see if the Internet can help make your telephone ring. In an age of million-dollar home pages, Easy Site removes much of the anxiety and sticker shock from getting your company on the Web. **Easy Site.** List price: \$39.95 plus \$19.95 per month. IMV Internet, San Jose, CA; 800-682-1530; www.imvi.com. Circle 429 on reader service card.



WEB LITE: Once Easy Site publishes your password-protected pages, you can review and even edit them online.

BOOKS

Spreading the Linux Gospel

By William Lee Valentine

Linux is one of the rare operating systems, or executives, that are "free"—meaning it's low in cost and freely modifiable. Linux (pronounced *Lin nucks*) is a Unix clone, a free copy of the famous Unix system.

Unix is so large and sophisticated that the learning curve can be steep. The books reviewed here attempt to make that curve manageable for the new Linux user.

Linux is actually the kernel for a Linux system: a multiuser, multiprocessing, Unix-style environment with windowing and communications capabilities. The bulk of the software that can be used with this kernel comes from third-party devel-

opers. A huge amount of software—clones of Unix utilities—is available, many of them from the Free Software Foundation in Boston.

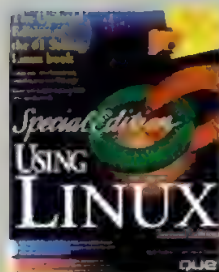
The books reviewed below offer valuable help in using Linux. In addition to installation instructions, they offer the new user an introduction to file systems, the use of the shell and the windowing system, system and network management, text editors, and the many utilities, as

well as the C/C++ compiler.

Up until now, Linux has been a coder's system. But as more and more users adopt the executive, it will become a general-purpose operating system. The five books we review below open the world of Linux up to everyone.

www.pcmag.com Visit www.zdnet.com/pcmag/discuss.htm from September 23 to September 27 to discuss Linux.

Taking a Closer Look at Linux



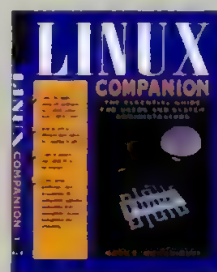
• **Special Edition, Using Linux** (\$59.99) addresses the needs of the nonprogrammer straightforwardly. The touch is deft; the writing is pleasant and readable. The authors, Jack Tackett, Jr. and David Gunter, lead the reader smoothly from one topic to the next. *Using Linux* is particularly valuable for the reader who uses a graphics environment, accesses the Internet, and runs packaged productivity software to edit text files and use spreadsheets. Two CD-ROMs are supplied, one with the Slackware distribution and one with Red Hat. The text covers installation with Slackware, and the book comes with a coupon for additional software. The authors do an excellent job of presenting material for a beginning audience. Que Corp.; www.mcp.com/que; ISBN 0-7897-0742-X.



• More compact in its presentation than *Using Linux*, *Linux: The Complete Reference* (\$39.95), also aims for users of canned programs. The author, Richard Petersen, focuses on communications—electronic mail, Internet access, the Web, and network management—but takes the reader further than *Using Linux* does. For example, *Linux: The Complete Reference* offers a helpful explanation of the shells provided under Linux, stopping just shy of giving programming instructions. Another focus is the use of Caldera Lite Desktop, which comes on the included CD-ROM, along with an accelerated X server, a text editor, and a Red Hat installation utility. Petersen is an impressive technical writer. McGraw-Hill; www.mcgraw-hill.com; ISBN 0-07-882189-4.



• *Linux Secrets* (\$49.99) is particularly strong in its treatment of hardware and its related problems. Dr. Naba Barkakati's book is the best in this group at resolving Linux installation problems: balky CD-ROM drives, modems, mice, and the like. This book also offers the most help with making hardware purchasing decisions. The Slackware disk sets are included on CD-ROM. The book's treatment of communications and networking is strong; it offers less help with shells and text editors. The order in which topics are presented can be puzzling; the book jumps from installation to the application of patches. Readers who want a more in-depth look at Linux but do not plan to program will find this book particularly valuable. IDG Books; www.idgbooks.com; ISBN 1-56884-798-X.



• *The Linux Companion: The Essential Guide for Users and System Administrators* (\$24.95) includes no treatment of installation but otherwise covers the normal topics required to inform a new user about Linux. Mark F. Komarinski, the author, compares facilities in Linux with those in DOS and Microsoft Windows much more fully than any of the other authors whose books we reviewed—a particular help to programmers. The treatment of most topics is less complete and systematic than in the introductory books, but Komarinski delves into details that no one else mentions. This book is clearly meant for the programmer who is moving to Linux. The nonprogrammer will have great difficulty. Prentice-Hall; www.prenhall.com; ISBN 0-13-231838-5.



• *Inside Linux: A Look at Operating System Development* (\$22) is different from the other books in this group. It is addressed to programmers who want to know how Linux works. The author, Randolph Bentson, explains where many features come from, how they work, and whether their design can be improved. Bentson's presentation is a general introduction to operating systems, using Linux as an example. His discussion of process control, semaphores, and deadlock may seem opaque to a reader who has not been exposed to some of the background articles. Nevertheless, the curious programmer would do well to begin the study of Linux with this volume. Specialized Systems Consultants; www.ssc.com; ISBN 0-916151-89-1.

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IMAGE EDITING

Adobe PhotoDeluxe: Premier PC Digital Snapshot Editing

By Luisa Simone

With a highly structured interface that guides novices through the complexities of image editing and a \$90 price tag, Adobe's PhotoDeluxe 1.0 is aimed squarely at the emerging consumer digital photography market. The bottom line is that this is the one program digital shutterbugs should have on their PCs.

The program offers the user a choice of two entirely different ways of working with images: Guided Activities and On Your Own. Guided Activities are just that—goal-oriented projects that are broken down into small, easy-to-understand tasks. On Your Own provides a broader set of tools but retains the product's easy-to-use interface.

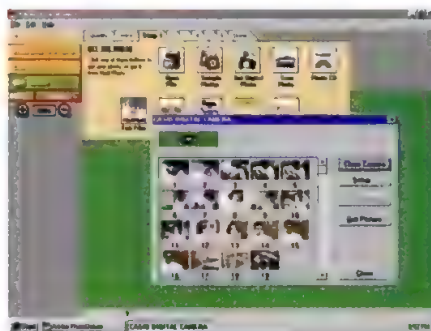
STEP BY STEP

In Guided Activities, each step within a project is presented on a numbered, tabbed panel. Guid-

In Guided Activities mode, you can choose one of three tracks: Touch Up Photo, Transform Photo, or Cards and More. The basic touch-up tools are designed to correct such common problems as color imbalance and red eye.

The fun really starts when you modify photos with the filter effects and collaging techniques. For example, you can turn a photo into an Impressionist painting or paste a portrait into an exotic background. PhotoDeluxe earns extra points by offering step-by-step projects that help you prepare both images for the Internet and portable digital files (.PDFs).

PhotoDeluxe lets you insert scanned images into dozens of different kinds of documents, including calendars, cards, flyers, stationery, and faux magazine covers. But it does so using tightly formatted templates and entirely bitmapped formats. So



EASY ENTRANCE: Access to existing pictures is a key feature of PhotoDeluxe. Here, the program downloads images from a digital camera.

to shield novice users from the more difficult concepts associated with advanced image-editing techniques. Instead of dealing with compositing methods and masks, PhotoDeluxe users simply store images in the Hold area (where they are saved to disk) while working on another piece of a complex project. Retrieving a picture from the Hold area automatically loads it as a floating selection.

In the same vein, the program provides an immediately understandable iconic representation of how multiple layers

in a project (such as the background, a photo, and floating text) are stacked on top of each other. There are even Clue cards that pop up to suggest the next step in the sequence or explain why an action didn't produce the desired result.

You can leave the security of Guided Activities for Work

On Your Own at any time. Even in this mode, the interface is highly structured, with tabs separating the program's tools into such categories as Orientation, Quality, and Effects. There's not only a richer set of selection tools, but you'll find over 50 special-effects filters and control over opacity and the blending of layers.

PhotoDeluxe owes much of its

power to Photoshop—Adobe's premier image-editing program for professionals and high-end users. Like Photoshop, PhotoDeluxe is extensible via the Adobe plug-in filter specification. The product ships with nine sample filters from Kai's Power Tools. Most important, along with Twain support, plug-ins give PhotoDeluxe direct

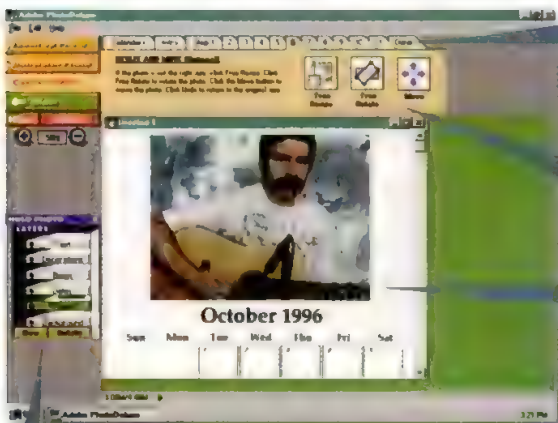
access to the world of scanned images. During evaluation, we used the Casio QV-10 camera (First Looks, October 24, 1995) to bring digital images into PhotoDeluxe.

STILL NEEDS DEVELOPMENT

Despite our genuine enthusiasm for PhotoDeluxe, it's not perfect. One improvement we'd like to see is a more visually intuitive way of handling image-correction. In addition, the On Your Own portion of the program should offer the user more control over the tools. For example, the Sharpen filter is a one-step operation with adjustments for neither strength nor thresholding. Finally, the program should support an automated color-management system to guarantee that screen images match printed output, because trial-and-error color printing can be quite expensive and time-consuming.

PhotoDeluxe includes hundreds of bitmapped clip images and a trial version of Berkeley Systems' After Dark Screen Saver and slide-show program. But the real reward is the creative fun this program can bring to the PC.

Adobe PhotoDeluxe 1.0. Street price: \$90. Requires: 8MB RAM, 5MB hard disk space, DOS 6.0, Microsoft Windows 3.1, Windows 95, or Windows NT 3.51; sound card recommended. Adobe Systems Inc., Mountain View, CA; 800-888-6293, 415-961-4400, www.adobe.com. Circle 401 on reader service card.



Take complete control of your image. Creating a calendar.

Online documentation of the tools is presented at any time.

Elements such as the calendar text and the photo are contained in separate layers for design flexibility.

GUIDED TOUR: PhotoDeluxe makes it easy to produce professional-looking projects by guiding the user through each step.

ed Activities presents the user with only those tools appropriate for the job at hand. While creating a calendar, for example, if you are given the opportunity to scale or reorient a picture, only the resize, rotate, and move functions are available.

even though the program intelligently segregates each element of a design on a separate layer, it doesn't provide the editing flexibility of a true desktop publishing program.

PhotoDeluxe boasts several interface conventions designed

DIGITAL CAMERAS

Fujix DS-220: The Modular Digital Photographic System

By Daniel Grotta and
Sally Wiener Grotta

Not just your average point-and-shoot digital camera, Fuji's \$1,200 Fujix DS-220 is an entire modular digital photographic system. It's an above-average but relatively expensive device for those seeking precise control over focus, framing, and lighting, as well as the ability to take accurate close-up shots.

The DS-220, which captures images at 640-by-480 resolution, comes equipped with all the expected features: autofocus, power zoom, exposure compensation, a slot for a Type I or Type II PC Card, and a built-in flash. In addition, it offers a few refinements, such as a video port (for displaying images on a television), red-eye prevention, a focusable diopter (for adjusting the viewfinder's focus), and adjustable sensitivity from an ASA equivalent of 120 to 240.

The DS-220's zoom lens isn't so much a zoom as a motorized toggle between telephoto and wide-angle settings. The camera even accommodates an optional auxiliary lens for an extra wide field of view.

The DS-220 allows users to add shooting or descriptive information to each frame or series of frames, as well as to set the built-in time/date stamp easily. Unlike other entry-level filmless cameras with simple, fixed optical viewfinders, the DS-220's viewfinder actually focuses as you move closer to or farther from the subject. To frame more accurately or to display the images to colleagues, you can either attach the camera to a television set or use the optional \$299 2-inch color LCD viewer.

Perhaps the most intriguing accessory is the DS-220's \$795 macro kit: twin strobes on either side of the lens for even illumination and three high-grade proxar close-up

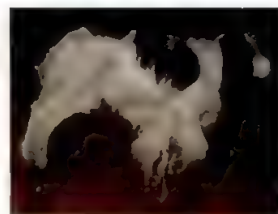


lenses that snap onto the main lens and extend the camera's range of focus from 4.75 inches for sharp close-ups to 15.75 inches.

At \$1,200, the DS-220 is not for the casual snapshotter. Even without the attachments, there are 15 buttons and switches and 5 slots and holes (not counting the tripod screw). Adding the macro kit and LCD screen makes the camera unwieldy for hand-held shooting.

The payoff is sharp 640-by-480 images that have excellent color

DOG DAY: The Fujix DS-220 takes sharp PC pictures and offers the user a variety of adjustments and other options.



balance. If a wide range of accessories and the ability to shoot close-ups are important, the Fujix DS-220 is for you.

Fujix DS-220 Digital Camera. List price: \$1,200. Requires: PC with serial port. Fuji Photo Film U.S.A. Inc., Elmsford, N.Y.; 800-378-3854. Circle 409 on reader service card.

Kai's Power Goo: Equal Parts Innovation and Fun

You've just offloaded a camera full of digital images into your PC and the fun is about to start. At least that's the premise behind Kai's Power Goo, a \$49.95 package from MetaTools that breaks new ground in terms of how the user interacts with the PC.

Load in a photo, and use your mouse to enlarge, shrink, move, smudge, distort, or create other fun house-like effects. There are no pull-down menus or traditional toolbars, because you control all the operations via nine hot spots. Each operation happens instantaneously, which gives rise to Power Goo's wonderful feeling of interactivity and creativity.

Power Goo's unusual interface consists of Goo Room, Fusion Room, In Room, and Out Room. The In Room feature, which brings images into the program, accepts .BMP, Photoshop, Photo CD, or .TIF files; any of the included clip

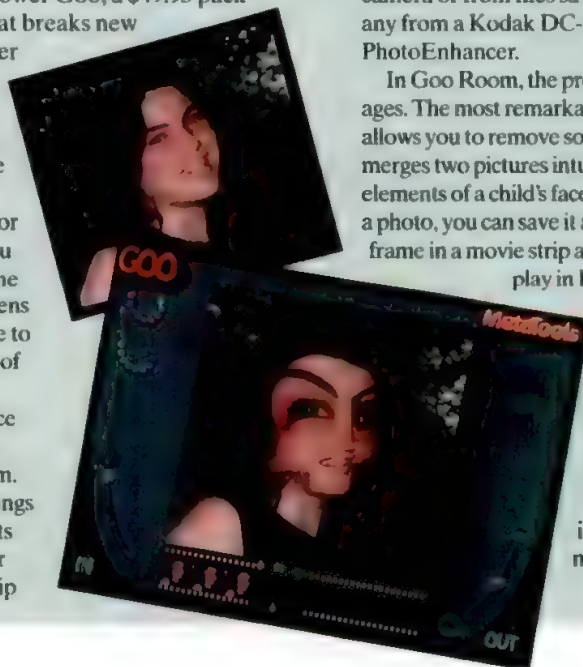
art; or the output of a filmless camera or Snappy video board. We had no difficulty opening pictures from a Kodak DC-20 digital camera or from files saved in Photoshop, but we couldn't access any from a Kodak DC-50 camera or from .TIF files converted by PhotoEnhancer.

In Goo Room, the program pulls, pushes, and manipulates images. The most remarkable feature is the UnGoo brush, which allows you to remove some or all changes selectively. Fusion Room merges two pictures intuitively and easily; for example, it can brush elements of a child's face over those of a cat's. When you've finished a photo, you can save it as a still image in Out Room, position it as a frame in a movie strip at the bottom of the screen (which you can play in Power Goo), or save it as an .AVI file.

For better or worse, Power Goo's documentation is nothing more than a poster that provides some basic pointers and a product overview. One annoying feature is that the CD must be in your CD-ROM drive for Power Goo to work, even if you don't want to access the clip-art library.

Power Goo may be a one-trick pony, but its innovative interface and exciting technology make it much more than a toy.

—DG and SWG



VOICE RECOGNITION

VoiceType: Talk to Your PC

By David Haskin

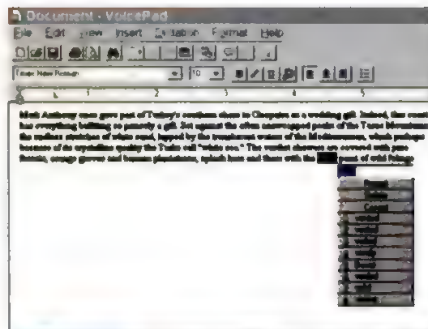
IBM's VoiceType 3.0 is a fast and accurate but sometimes clumsy way to dictate text into your applications. Like other dictation products, the \$699 VoiceType requires that you pause for a fraction of a second between words, but the program provides tools for correcting documents after you finish them instead of requiring you to fix errors on the fly.

VoiceType records your voice as you dictate. When you start correcting the document, double-clicking on a word plays back how you pronounced it so you don't have to guess at what you said. Double-clicking also displays a list of similar-sounding words from which you can select a replacement. This approach enables you to correct documents yourself or assign the proofreading to someone else. In contrast,

DragonDictate (First Looks, November 8, 1994) and Kurzweil Voice (First Looks, August 1996) are set up to correct words during dictation, which can interrupt your train of thought.

On our tests, we found VoiceType to be fast and accurate. Within 15 minutes of installation, we consistently speed-read at a rate of 100 words per minute with 90 percent accuracy. In previous tests, VoiceType's competitors achieved speeds of 65 to 75 words per minute with near-perfect accuracy, but that was only after several hours of training. But since VoiceType requires that you proofread after finishing the dictation, VoiceType and its competitors achieved roughly the same speeds.

VoiceType has an easy-to-use series of dialog boxes for creating new voice macros and can be



PROOFREADER: After you finish dictating, VoiceType can play back your session and display lists of alternative words.

used with Microsoft Word for Windows. Annoyingly, the installation process didn't automatically integrate our existing macros and other customized elements into the new template, a shortcoming IBM promises to fix. Another gripe is that VoiceType's microphone setup utility is confusing and hidden in the Help system.

VoiceType's abilities to navigate through your applications

and Windows desktop are clumsy compared to its competitors'. You can't use your voice to position your mouse pointer quickly and precisely.

VoiceType 3.0's relatively weak voice navigation tools mean it won't appeal to many people, including the physically handicapped, who require hands-free

PC use. It does an excellent job of providing eyes-free dictation without any interruptions.

IBM VoiceType 3.0 for Windows 95. List price: \$699. Requires: 90-MHz Pentium PC, 16MB RAM, 256K external cache, 30MB hard disk space, Microsoft Windows 95. IBM Worldwide Speech Systems, Somers, NY; 800-825-5263; www.software.ibm.com/workgroup/voicetyp. Circle 413 on reader service card.

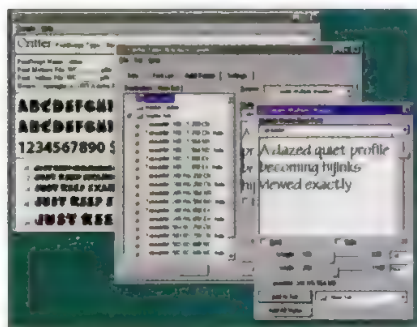
WINDOWS UTILITIES

Adobe Type Manager Fills in the Fonts Your PC Doesn't Have

By Edward Mendelson

Adobe Type Manager Deluxe 4.0, the latest version of Adobe's \$99.95 utility for displaying and printing PostScript Type 1 fonts on any screen or printer, has blossomed into a full-featured font management program. It has features that let you activate different subsets of your fonts for different projects and the ability to simulate fonts that are specified in a document but are not on your PC.

Unlike earlier versions, Adobe Type Manager (ATM) now manages fonts in both Type 1 format and Microsoft Windows' native TrueType format. A well-organized interface lets you install, uninstall, and delete Type 1 and TrueType font files, and a single click displays a sample page of fonts before or after you install them. You can organize related groups of fonts into sets that you



DESKTOP FOUNDRY: Adobe Type Manager Deluxe's Multiple Master format allows you to create custom typefaces.

can leave dormant on your disk until you open the ATM control panel and click on the names of one or more sets. The fonts in the selected sets now appear on Windows' font menus, and you can remove them by returning to ATM.

A separate auto-activation feature automatically loads a dormant font into Windows when

one of your documents requires it. A font substitution feature uses a stretchable generic font to imitate the character spacing and proportions of a font missing from your system; the same feature is already

built into Adobe Acrobat. Other features include anti-aliasing to smooth the edges of Type 1 fonts, matching the optional anti-aliasing feature in Microsoft's Plus! for TrueType fonts. Unfortunately, both Adobe's and Microsoft's implementations of this feature generally make fonts look worse rather than better.

Thirty Type 1 fonts come in the package, including samples of Adobe's elegant Minion and Poetica families, and a version of the popular Tekton font in Adobe's Multiple Master format. A Multiple Master font-creator window, available from the main control panel, lets you adjust any Multiple Master font.

ATM 4.0 works only under

Windows 95; a Windows NT version is promised for later this year. The program's font management features aren't as automated as similar features in Ares Font-Minder 3.0, a utility recently acquired by Adobe. FontMinder's features include the ability to activate whole font sets automatically when you launch a specific application—unlike ATM, which makes you load font sets by hand. ATM users can only hope that FontMinder's features will be incorporated into ATM, which remains the only utility that does the work of rendering Type 1 fonts on screen and on non-PostScript printers.

Version 4.0 is an essential tool for anyone who uses more fonts than the handful that are built into Windows.

Adobe Type Manager Deluxe 4.0. List price: \$99.95 (introductory price: \$49.95). Requires: 8MB RAM, 7MB hard disk space, CD-ROM drive, Microsoft Windows 95. Adobe Systems Inc., Mountain View, CA; 800-833-6687, 415-961-4400; www.adobe.com. Circle 412 on reader service card.

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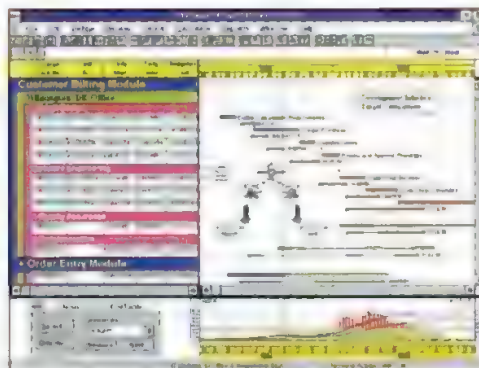
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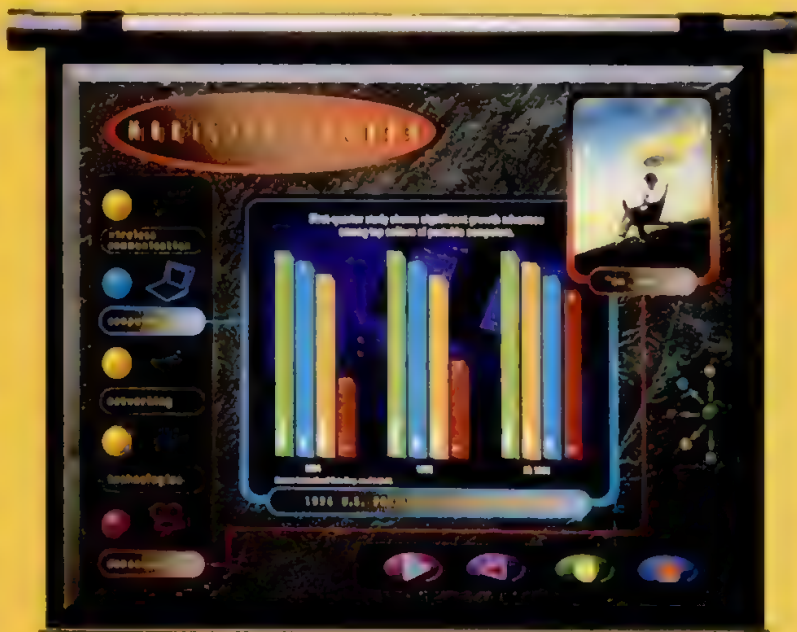
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CONTACT MANAGEMENT

Get Your Workgroup's Act Together with Act! for Notes

By Tony Pompili

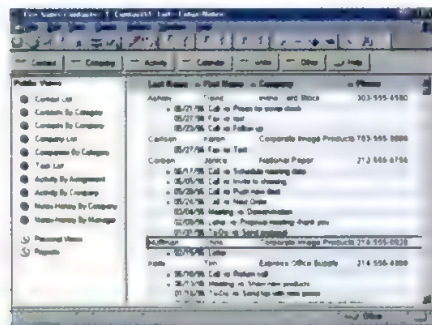
Name-brand contact management has come to Notes users with Symantec's new Act! for Notes. Similar in functionality to its Windows and Macin-

siblings, because it's built around Lotus Notes, Release 4. Using Notes views, forms, and documents, Act! for Notes will be most familiar to and welcomed by Notes shops seeking a turnkey contact

management system.

Act! for Notes gives users a set of tools for collecting and tracking companies and contacts, such as sales leads and customers. Symantec is one of the first large companies to join the Notes database development business.

To install the program, you use a clever script built entirely using Notes tools. Users must already have Notes 4 installed on their workstations. Act! for Notes works best on networks, but with Notes replication users can also work off-line and replicate their changes over dial-up connections.



NOTABLE NEWS: Act! for Notes puts all of your contacts and activities in Notes views.

tosh counterparts, the \$249 Notes version leverages the workgroup software's strong security and shared database environment to extend Act!'s shrink-wrapped functionality to Notes users.

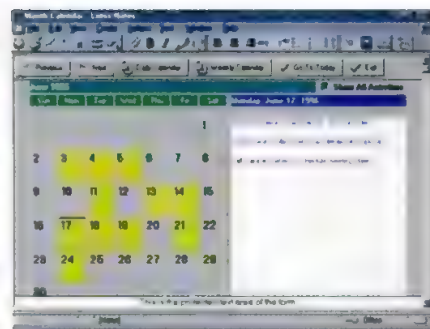
This newest iteration of Act! has a different look and feel than its

Act! for Notes consists of two main databases: the description database and the contact database, which is where users spend most of their time. You can add and modify contacts, and associate them with companies.

Sharing contact information is one of the primary advantages of Act! for Notes. While databases can be set up to allow access to a range of users, Notes Access Control Lists (ACL) can also restrict contact database access to specified groups. Since contact information can be competitive even among authorized users, Act! for Notes allows users to restrict access further on a document-by-document basis.

Using Act! for Notes's views, it's easy to view summary information about contacts, activities, and companies. Act! for Notes also provides tools for creating letters or faxes to send to contacts.

For companies interested in seeding Act! databases, Act! for Notes also has an option for importing and exporting databases with the Windows, Macintosh, and



GET IT TOGETHER: The Calendar form lets you plan daily, weekly, and monthly activities.

other versions of Act! While not intended to keep disparate versions of the product in sync, the import/export tool is at least a good way to migrate Act! data to Notes.

Act! for Notes combines the best of two worlds: the ease of use and flexibility of an off-the-shelf product and the security and scalability of a workgroup solution. As such, it is a welcome addition to the growing ranks of third-party Notes applications.

Act! for Notes. List price: Per user, \$249. Requires: 8MB RAM, Lotus Notes 4, Microsoft Windows 3.x or Windows 95. Symantec Corp., Cupertino, CA; 800-441-7234; www.symantec.com. Circle 407 on reader service card.

MATH SOFTWARE

Maple Moves to the Big Leagues

By Barry Simon

In a single stride, Waterloo Maple has caught up with the symbolic-math software competition. The latest version of Maple matches Macysma, MathCAD, and Mathematica feature for feature. With a revamped user interface, new functions, and enhanced plotting features, the \$995 Maple V, Release 4, is at the head of the symbolic-math pack.

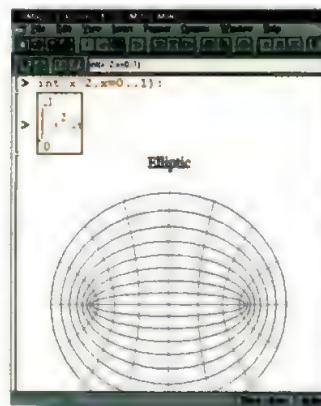
Maple borrowed from the competition in overhauling its user interface. The program now supports collapsible multiple-level outlines—a hallmark of Mathematica. And, like the recent release of MathCAD, Maple lets you set up hyperlinks between files. Also, you can toggle easily between mathematical expressions.

But the most spectacular interface enhancement—unique among the symbolic-math programs—is the ability to display input in typeset format. For example, while you still need to enter integrals in text format as `int(sin(x),x=0..1)`, a button will let you toggle to a window displaying that expression in typeset format.

You can switch the display of a given formula to mathematical notation, but you must enter the formula in Maple's language; there is no direct input from symbol palettes as there is in MathCAD and Scientific Workplane. Another new interface enhancement is a word processor type ribbon, with a drop-down menu of fonts and paragraph formatting functions.

One interface weakness remains. To see what a toolbar button does, you must press it and read the hint on the status bar. The package makes no use of the Windows 95 interface and lacks support for long filenames.

The emphasis of this upgrade is



ADD IT UP: New features include the ability to display input in mathematical format.

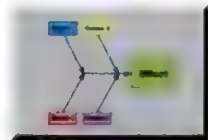
on user interface improvements, but there are also new symbolic-math features, including routines to handle inequalities and solve sets of equations and inequalities symbolically. Dozens of new functions can be handled numerically or have been extended to the complex plane. Basic financial functions, statistical ANOVA, and numeric linear algebra routines have been added.

Maple V, Release 4, is the current symbolic-math champion. But with an upgrade to Mathematica on its way, this designation could be short-lived.

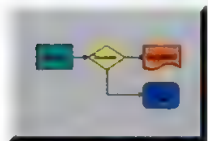
Maple V, Release 4. List price: \$995. Requires: 8MB RAM, 18MB to 30MB hard disk space, Microsoft Windows 3.1, Windows 95, or Windows NT. Waterloo Maple Inc., Waterloo, Ontario, Canada; 800-267-6583, 519-747-2373; www.maplesoft.com. Circle 408 on reader service card.



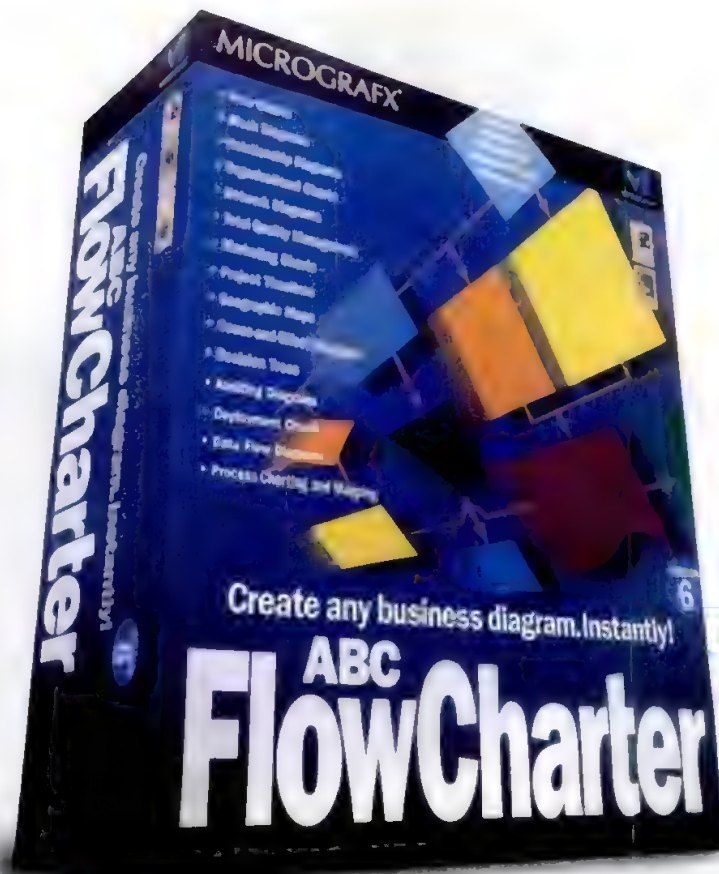
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Second Looks

LIVING WITH THE PRODUCTS WE REVIEW

By Brian Nadel

WEB SITES

Travelocity Shows Where You Are and Where You're Going

IT'S AN UNDERSTATEMENT TO SAY THAT THINGS CHANGE quickly on the Web. No sooner had our review of travel-related Web sites appeared (First Looks, September 10, 1996) than Travelocity unveiled a major upgrade. In addition to its already formidable database of travel information, Travelocity has added street-level maps.

Compiled by Vicinity Corp., these maps cover only selected major



U.S. cities, so finding the map you need can be a hit-or-miss proposition. Maps are available for more than 20 locales, including New York, Chicago, and San Francisco. Although Travelocity maps can show you where you want to go, they

won't tell you how to get there; the site does not provide directions. The maps show major streets, and you can zoom in and out to customize them. Ironically, the maps identify nearby landmarks, but the destination you select usually appears only as a bull's-eye without any further identification.

While you're at the Travelocity site (www.travelocity.com) making maps for your next business trip or flight of fancy, check out the new currency converter. It is frequently updated, and it makes quick work of calculating the exchange rate between escudos and zlotys.

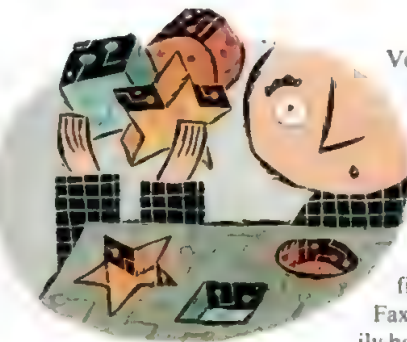
CD-ROM DRIVES

Shuffle a Deck Of Disks

OUR PRAISE FOR THE ABILITY of NEC's MultiSpin 4x4 to shuffle a quartet of CD-ROM disks was tempered by the drive's inability to assign a single drive letter to all four CDs under Microsoft Windows 95. In addition, on our tests the MultiSpin 4x4 would random-



ly select disks and take as much as half a minute to settle down (First Looks, February 20, 1996).



DATA EXCHANGE

Make Your PC Do All the Work

WITH SUPPORT FOR SUCH popular programs as Lotus Notes, Microsoft Excel and Word, and Symantec Act!, Oberon's Prospero automation tool gets your PC's applications to share information and automate repetitive data-heavy processes (First Looks, May 14, 1996). Although Version 1.0 allowed you to link programs with data sources and a variety of output choices, Prospero's Achilles' Heel was the lack of a true OLE server for working with any Windows program.

Recently, Oberon released

Version 1.1, which adds a fully functional OLE 2.0 server to Prospero's purpose-built linkers. With the server in place, you can use the program to transfer data from an Access database to a Word file and then fax it via Win-

Fax Pro. Although this can easily be done manually, Prospero did it without intervention. For those who are Web-minded, Prospero can now convert the contents of a database into an HTML file.

This upgrade is available to Prospero users for \$195; the entire Version 1.1 program costs \$695.

BUG BRIEFS

PROBLEM

Beta 2 of Internet Explorer 3.0 (First Looks, September 10, 1996) installs a new common dialog box .DLL, which can disable the toolbars of some programs.

SOLUTION

Get hold of the original Windows installation disks for your PC and manually install the COMDLG32.DLL over the one that IE 3.0 installed.

PROBLEM

A new macro virus, called Macro/Laroux, has appeared that can infect Excel spreadsheets.

SOLUTION

Go to Microsoft's Web site (www.microsoft.com), and download and run the Laroux virus scanner. The file is named XLSCAN.XLS.

LOOKING AHEAD

Tell us what you love and hate about these products and we'll share the information in future issues. • Color ink jet printers • Cyrix PCs • EZ SCSI

4.0 • Lotus Notes Release 4 • Microsoft Internet Explorer • Netscape Navigator • Pentium Pro PCs • RealAudio • SoftWindows • Windows 95 utilities.

Contact Brian Nadel directly via MCI Mail (556-1500) or CompuServe (72241,1616), or on the Internet at BNadel@zd.com.

HOW WILL THE LAUNCH OF MID-RANGE COMPUTING? LET'S JUST

The Compaq ProLiant 5000 has arrived. And it's going to change everything that lies in its path. Including how you think about mid-range computing.

The ProLiant 5000, with its Pentium® Pro processor, delivers unprecedented performance for mid-range solutions.

But that's just the first half of the story.

In today's client/server environment, you need more than power—you need control. So we've combined the Pentium Pro processor with a concept we're calling Integration Management. Giving you new tools to manage your system throughout its entire life cycle.

Improvements to SmartStart now let you set up an Integration Server, which basically serves as a holding tank for all your software. It also simplifies the setup and maintenance of your network. All you have to do is configure your Integration Server and then, using SmartStart, deploy it across your entire network. It not only ensures consistency across

all your network servers, it saves you a lot more than just shoe leather.

Maintaining your network is easier now, too. Thanks to some cool new features on Compaq Insight Manager, you can get updates and new software revisions via the Internet, your modem or CD. And then

transfer them to the Integration Server just one time. You can even maintain your network

when you're away from the office. All you need is your notebook and a phone line.

We've also partnered with the industry-leading companies of system management applications. So now you can view your entire network in one place. Together, these and other improvements have helped reshape the landscape of mid-range computing, by creating the most manageable server in the industry. To find out more about the ProLiant 5000, visit our Web site at www.compaq.com, or call us at 1-800-315-7772. It's not just a server. It's a force to be reckoned with.

System	1 pent	% pentium
ProLiant 5000 6/166 M2	\$676.93	\$135
HP 9000 Server T500	\$621.00	\$380*
WorldMark 5100S	\$607.00	\$394
SPARC center 2000E	\$124.21	\$323
HP 9000 Model K420	\$939.11	\$232
IBM RS/6000 J30	\$631	\$289

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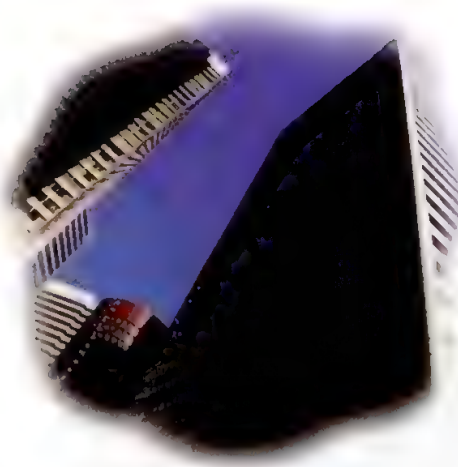
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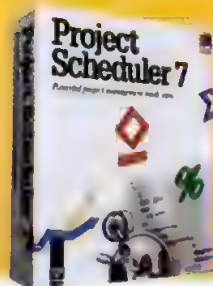
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In So. Africa: (011) 706-7015 In Sweden: 46 40 122774 In the UK: 1384-392121 Project Scheduler 7 is a registered trademark,
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New & Improved

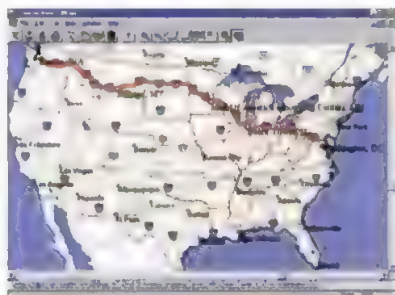
NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Melissa J. Perenson

Getting from Here to There

HOW DO YOU GET FROM point A to point B?

You could use DeLorme Mapping's \$39 **AAA Map'n'Go**, an effective



POINT-TO-POINT ROUTING: *TravRoute's Road Trips Door-to-Door.*

travel and mapping tool that offers the Automobile Association of America's TourBook database, cataloging over 57,000 accommodations, restaurants, and points of interest. The package includes street-level maps and street-address searching for 241 metropolitan areas; multiple trip-

routing options; and a link with DeLorme's CD-ROM phone directory, Phone Search USA.

For more specific travel routing aid, turn to TravRoute Software's \$49.95 **Road Trips Door-to-Door**. It offers the street-level driving directions that are lacking from other street atlas and trip planning packages. This 32-bit package maps out your route based on any start and destination addresses, drawing on its vast database of 95 million home and business addresses and over 1 million points of interest.

DeLorme Mapping, Freeport, ME; 800-452-5931, 207-865-1234; www.mapngo.com. **Circle 414** on reader service card.

TravRoute Software, Princeton, NJ; 800-297-8728, 609-252-8197; www.travroute.com. **Circle 415** on reader service card.

Music Remote

SOMEHOW, USING YOUR PC'S CD-ROM drive to play music just isn't the same: You miss the convenience of your standalone audio CD player's remote control.

Well, Labtec's \$39.99

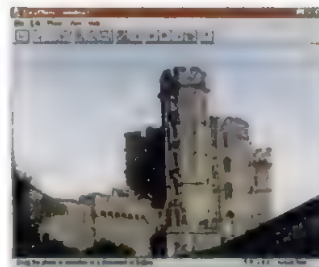
QuickSound LCS-8010 even the playing field—somewhat. The compact serial-port device provides one-touch access to volume, tone, balance, mute, and other Windows mixer functions. **Labtec Enterprises**, Vancouver, WA; 360-896-2000; fax, 360-896-2020. **Circle 416** on reader service card.

PHOTOGRAPHS BY LES MORISILLO

A Scanner for the Rest of Us

NOT TOO LARGE, NOT TOO SMALL. You could say that Storm Primax's **Easy-Photo SmartPage** is just right for those who need full-page color scanning without the bulk and functionality of a flatbed scanner.

SmartPage, priced at \$299, has lots of versatility packed into a small footprint. The scanner accommodates photos of up to 8 by 10 inches, as well as documents from business-card size to legal size. Photos are scanned in at 24-bit color, 300-dot-per-inch resolution. Storm's proprietary **ClearScan** technology automatically detects and adjusts dark areas of photos during the scan process. For added convenience, there's a 10-page document feeder. The scanner connects to your PC via a plug-and-play interface card.



Bundled software includes Storm's **Easy-Photo 2.0**, Xerox Textbridge optical character recognition (OCR) software, and a TWAIN-compatible driver.

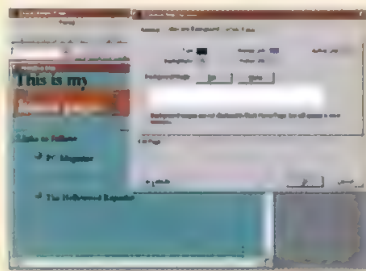
Storm Software, Mountain View, CA; 888-438-3279, 415-691-6600; www.easypphoto.com. **Circle 428** on reader service card.

HOT PROSPECT

Home Page Design for Novices

Now you have no excuse. Claris Corp.'s \$99 **Claris Home Page** makes creating your own home page so easy, there's no reason for you to delay further.

Using a WYSIWYG graphical interface, **Claris Home Page** lets you craft Web



pages without any knowledge of HTML's increasingly arcane codes. Most styles are applied through the menu items or the floating tool bar. The ability to edit raw HTML code opens this package up to more experienced designers as well.

There's a table editor for creating tables with varied column and row sizes, and an easy-to-use frames editor for putting multiple pages within a single page. Other convenient features include a find-and-replace function for speedy updating, a document statistics page for discerning estimated page download times, a browser preview, over 500 Web-ready graphics, and a customizable library for storing frequently used text, images, and HTML code, which can then be dropped into a new page.

Claris is bundling a coupon good for up to six months of free Web page hosting service provided by HoloNet.

Claris Corp., Santa Clara, CA; 800-544-8554, 408-727-8227; www.claris.com. **Circle 411** on reader service card.

Mighty MO

MAGNETO-OPTICAL DRIVES gained a new, mobile lease on life with Fujitsu Computer Products of America's \$499 **DynaMO 230 Portable PC Card drive**.

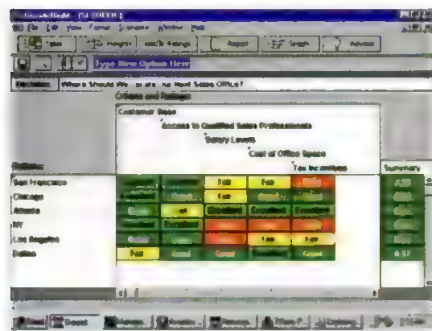
The 3.5-inch, 230MB drive weighs just 15.8 ounces, connects via a PC Card interface, and can be powered by either an AC adapter or an attachable battery pack that uses four standard AA batteries. The 8-Mbps transfer rate of the PC Card connection provides nearly eight times the throughput of a standard parallel connection. An MO disk is included with the drive; additional disks are priced at \$24.

Fujitsu Computer Products of America Inc., San Jose, CA; 800-626-4686, 408-432-6333; www.fcpc.com. **Circle 418** on reader service card.

Sales and Marketing Assistants

THREE PACKAGES ARE HELPING TO SIMPLIFY EVERYDAY processes for sales and marketing professionals.

Avantos's \$99 **Decide Right 1.2 for Windows 95** brings this decision-making aid to the Microsoft Windows 95 platform. The package helps you through the decision-making process, consensus-building, and developing support for your decisions; it also generates reports, charts, and slides that further justify your course of action. The package is Internet-ready, so you can send files using Microsoft Exchange e-mail or create an HTML-formatted executive summary of your conclusions for viewing over an intranet or the Internet.



DECISION HELPER: Avantos's *Decide Right*.

the new version of its sales automation and contact management software, the \$249.95 **TeleMagic Professional 2.0**. The Accounting Link is a general-purpose accounting application interface that can be used to synchronize your databases between TeleMagic and most accounting software; the link also adds specific accounting-related fields to the TeleMagic database.

Proposal writers can gain an edge with Pragmatech Software's **The RFP Machine, Version 2.0 for Windows** (\$695). Essentially an automated proposal-response system, this package assists in the process of responding to your prospects' requests for proposal. The software supports popular Windows word processors and spreadsheets.

Avantos, Emeryville, CA; 800-282-6867, 510-654-4600; www.avantos.com. *Circle 419 on reader service card.*

TeleMagic Inc., Dallas, TX; 800-835-6244; fax, 214-733-4251; www.telemagic.com. *Circle 420 on reader service card.*

Pragmatech Software, Amherst, NH; 800-401-9580; fax, 603-673-0687; www.rfpmachine.com. *Circle 421 on reader service card.*

Not Just a Fax

A NEW ENTRY INTO the high-volume, high-end multifunction printer market is the \$3,595 **JetFax M5 SST**. It combines a standalone plain-paper fax with a computer fax, printer, copier, and scanner.

The M5 SST emphasizes speed, thanks to the integrated 33.6-Kbps fax modem and the scanner's

scanning rate of three seconds per page at 300 dots per inch.

The printer offers a 300-dot-per-inch laser LED printer based on Oki-data's four-page-per-minute engine. The device includes 2MB of memory, capable of storing 144 pages of incoming faxes.



JetFax Inc., Menlo Park, CA; 800-753-8989, 415-324-0600; www.jetfax.com. *Circle 423 on reader service card.*

The Next Link

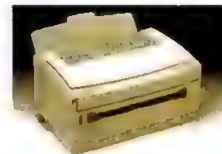
TAKING FILE TRANSFER AND synchronization to the next plane is Traveling Software's \$149 **LapLink for Windows 95, Version 7.5**. Enhancements include: data encryption for safe file delivery over the Internet during remote-control, remote-node, or file transfer

sessions; file transfer recovery, which allows LapLink to resume downloading if your modem connection is severed; disk caching for improved remote performance; and shortcuts for one-click remote access.

Traveling Software Inc., Bothell, WA; 800-343-8080, 206-483-8088; www.travsoft.com. *Circle 424 on reader service card.*

Okidata's LED Bargain

TARGETING THE INDIVIDUAL AND SOHO MARKETS IS OKI-data with its \$299 **Okipage 4w**. The printer, which measures just 5.9 by 12.2 by 7.5 inches (HWD), features a straight paper path and a 100-sheet auto-feeder. The Okipage uses a 600 dpi, four-page-per-minute LED engine to achieve near-laser-quality results. The unit comes standard with 128K of memory.



Okidata, Mount Laurel, NJ; 800-654-3282, 609-235-2600; www.okidata.com. *Circle 425 on reader service card.*

BRIEFS

Books

Take a handful of HTML tags, add a dash of .GIFs **The Web Page Recipe Book**, by Barrie Sosinsky and Elisabeth Parker, will have you creating Web pages in less time than it takes to fix dinner. With over 40 easy-to-follow recipes and a CD-ROM with 1,500 pieces of clip art, this is truly the Web authoring book for the rest of us (\$29.95, Prentice Hall, 800-947-7700) If you think of REM as a BASIC command—not a rock band—then McGraw-Hill's **Programmer's Desk Reference** is for you. This comprehensive dictionary covers four major programming lan-

guages: Assembly, BASIC, C, and Pascal. And it includes code samples. (\$50, paperback, McGraw-Hill, 800-262-4729) You already know how your spreadsheet program works. Now, learn what you can do with it with the **Professional's Guide to Robust Spreadsheets**, by Ronny Richardson. (\$39.95, Prentice Hall, 800-947-7700).

Internet

Mass-mailings over the Internet have just become easier with Alpha Software's \$99 **NetMailer**. Whether your list has 2 people on

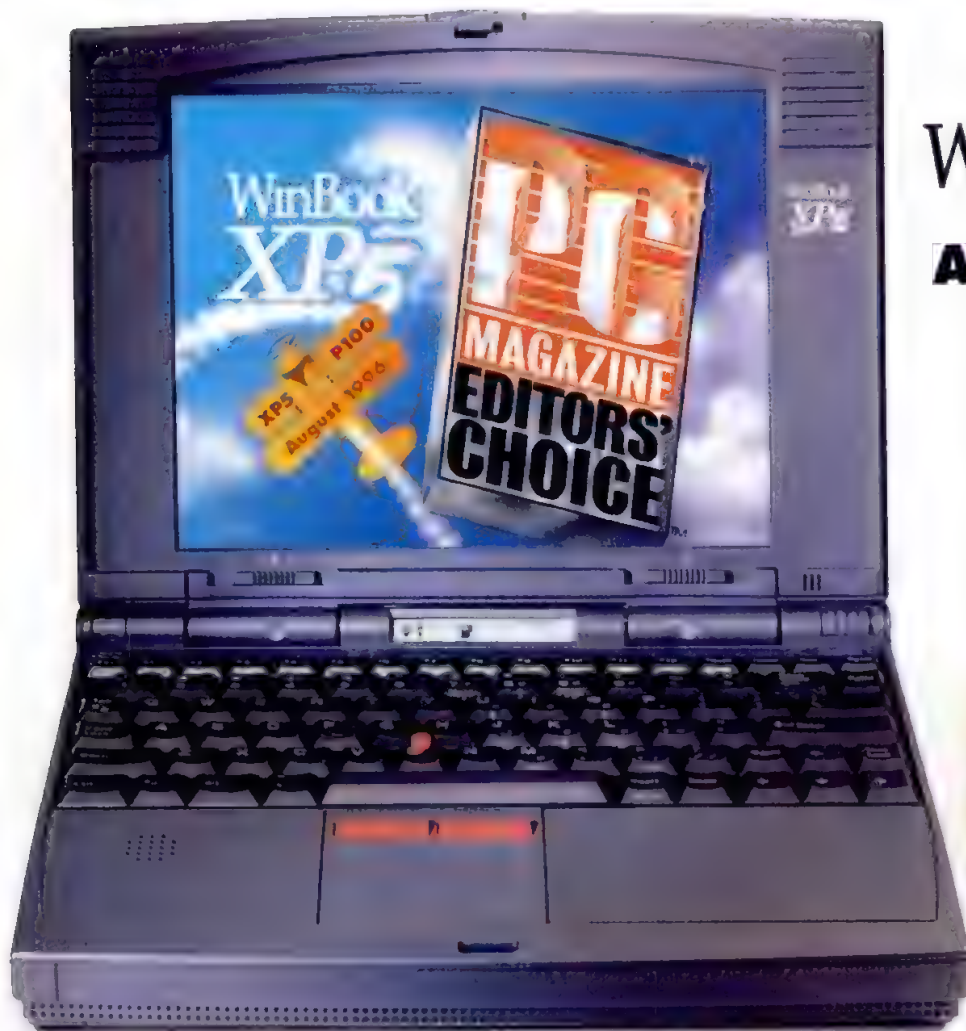
it or 200, this database-driven package personalizes each recipient's message, including the salutation and address (617-229-2924) Level5 has improved its Internet database publishing tool. The \$44.95 **Quest Server, Version 2**, includes improved database analysis, automatic links to Web pages from Quest results, and an interactive means of publishing searchable databases on the Web (800-444-4303) Inmagic's \$5,500 **DB/Text WebServer 1.0** is a powerful data management tool that functions through a textbase client. The software, whose dynam-

#1 BEST BUY AND EDITORS' CHOICE!

PC Magazine, EDITORS' CHOICE "...combines high-end components and solid performance with reasonable prices..." — August 1996



PC World Magazine
#1 BEST BUY: POWER SYSTEMS
"Great price, performance, features."
— June 1996



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ACTIVE MATRIX

**100MHz PENTIUM®
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Add a dual-button touchpad for only \$79.99

XP5 STANDARD FEATURES

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- Designed for Windows 95
- Free three-year limited warranty for parts and labor¹

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- Free three-year limited warranty for parts and labor¹

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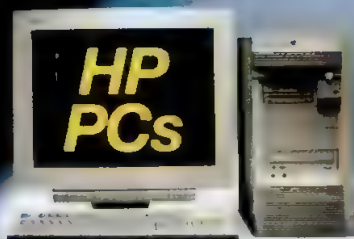


HP Vectra VL

The ultimate PC.

- Intel Pentium Pro 150, 180 or 200 MHz processor with 256KB integrated cache
- Supports dual processing with secondary Pentium Pro socket
- 128-bit high-performance memory architecture
- 16-32MB ECC DIMM memory standard, expandable to 256MB with 8 DIMM memory expansion slots
- PCI integrated Ultra SCSI Fast 20 interface with 20MB/s throughput
- 1,000MB** SCSI-2 high-performance hard drive
- PCI Matrox Millennium graphics card with 3D acceleration and 2MB WRAM, upgradable to 4MB or 8MB
- 7 mass storage shelves (5 front accessible)
- 6 expansion slots: 3 PCI, 1 PCI/ISA combo and 2 ISA
- 10Base-T/100VG AnyLAN selectable PCI NIC with up to 100 Mb/s throughput
- Integrated 16-bit audio and 4X CD-ROM
- Microsoft Windows NT® 3.51
- Free three-year limited warranty for parts and labor†

from **\$3,939***

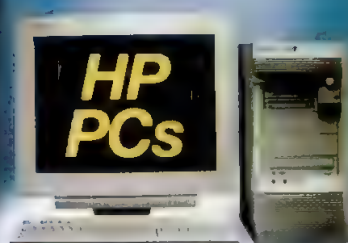


HP Vectra XU

Exceptional performance
and expandability at an
affordable price.

- Intel Pentium Pro 150 MHz processor with 256KB integrated cache
- 128-bit high-performance memory architecture
- 16MB DIMM memory standard, expandable to 256MB with 8 DIMM memory expansion sockets
- 1,000MB** Enhanced-IDE hard drive
- PCI Matrox Millennium graphics card with 3D acceleration and 2MB WRAM, upgradable to 4MB or 8MB
- 7 mass storage shelves (5 front accessible)
- 6 expansion slots: 3 PCI, 1 PCI/ISA combo and 2 ISA
- Integrated 16-bit audio and 4X CD-ROM
- Microsoft Windows NT 3.51 or IBM OS/2® Warp
- Free three-year limited warranty for parts and labor†

from **\$2,615***



HP Vectra VT

Helpful hint:

Rip out and pin up next to
Compaq and IBM ads.

A little comparison shopping will quickly show you that HP puts the best prices on the most impressive PCs. One standout is the network-ready Vectra XM. It's configured for the most demanding networks with LAN Remote Power, Super-fast LAN install and HP Vectra Op-Center for more effective remote management. Every Vectra will outshine the competition when it comes to features and price. From the Pentium® processor-based PCs to the dual Pentium Pro processor-based HP Vectra XU PC. For more information or the name of your nearest HP reseller, call 1-800-322-HPPC, Ext. 1703! Or visit us at <http://www.hp.com/go/vectra>.

NEC Is Ready for Action

GEARING UP FOR THE HOLIDAYS, NEC HAS UNVEILED 11 models of **NEC Ready PCs** for home-entertainment and home-office use.

The new systems include remote control for powering the cursor and gaining quick, one-button access to the Internet and such key functions as the integrated telephone answering machine and CD-ROM player. The systems include color-coded cables for simple set-up. All but two of the systems now offer an IrDA port on the mini-tower chassis.



At the lower end of the spectrum, the \$1,799 Ready 9620 offers a Pentium 133-MHz CPU, 16MB of EDO RAM, a 1.6GB hard disk, 2MB of video RAM, a 33.6-Kbps modem, an 8X CD-ROM drive, 3-D video and graphics, and remote control. Toward the high-end is the \$2,999 Ready 9629, which comes standard with a Pentium 166-MHz CPU, 32MB of EDO RAM, a 3.2GB hard disk drive, 2MB of VRAM, a 33.6-Kbps modem, an 8X CD-ROM drive, an internal Iomega Zip drive, a 25-watt amplifier/equalizer, a 40-watt speaker system, 3-D video and graphics, and remote control.



The NEC Division of Packard Bell NEC, Mountain View, CA; 800-632-4636, 508-264-8000; www.nec.com. Circle 426 on reader service card.

All-in-One Web

BY TAKING A LITTLE OF this and a little of that, Quarterdeck Corp. has assembled the \$99.95 **TotalWeb 1.0**, a complete top-to-bottom Web publishing system.

TotalWeb features an array of the tools needed to write, publish, and view Web pages. The standalone HTML editor, WebAuthor Pro, is based on InContext Corp.'s Spider, while

the handy WebImage utility is derived from Group 42. A drag-and-drop image-map editor, WebImage, also assists in creating transparent .GIFs. Quarterdeck's 16-bit and 32-bit Web servers are included, as is InternetSuite 2, which provides tools for FTP, telnet, e-mail, and Web browsing.

Quarterdeck Corp., Marina del Rey, CA; 800-282-0866, 310-309-3700; www.quarterdeck.com. Circle 427 on reader service card.

The Big Picture

TIRED OF SQUINTING? VIEW-Sonic Corp.'s latest high-end monitor, the **ViewSonic P815**, offers a roomy 21-inch (20-inch viewable area) flat, square monitor screen with high image quality.

The \$2,195 P815 offers 0.25-mm dot pitch and Invar Shadow Mask for ultrasharp images. It supports resolutions of up to 1,800-by-1,440 at 76-Hz refresh and 1,600-by-1,200 at 90-Hz refresh. The high 250-MHz video input bandwidth



and horizontal scan range of 30 to 115 KHz is available for even the highest resolutions.

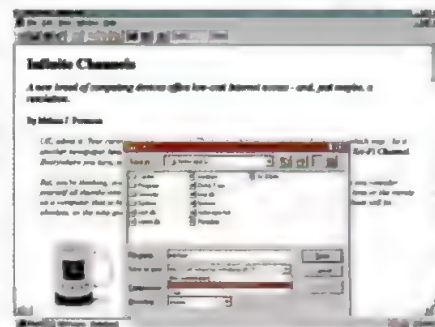
ViewSonic Corp., Walnut, CA; 800-888-8583, 909-869-7976; www.viewsonic.com. Circle 431 on reader service card.

Internet View Hole

AS THE INTERNET—AND CORPORATE INTRANETS—CONTINUE to grow, the need for viewing and converting different file and multimedia formats keeps growing as well. FTP Software's handy, versatile utility, **KEYview 5.0**—a bargain at \$35—builds on the strong capabilities of the previous version by providing seamless file viewing and conversion.

In addition to offering zip, unzip, uuencode, and BinHex file compression, and supporting 200 file formats, KEYview now handles such multimedia formats as .AVI, MIDI, MPEG, QuickTime, and .WAV. Also new is the ability to convert files to and from HTML. KEYview also acts as a Netscape Navigator plugin, or can be used as a helper application under Navigator.

FTP Software Inc., Andover, MA; 800-282-4387, 508-685-4000; www.ftp.com. Circle 417 on reader service card.



BRIEFS

ic data display allows for multiple views of the same data, eases the process of setting up field-searchable textbases (800-229-8398).

Hardware

Sycam Technologies' digital audio recorder, **Total Recall**, is now offering \$59.95 **PC Audio Link**, a hardware and software package that facilitates uploading your voice recordings to your PC (800-773-2503) Plasmon Data's \$699 **Afterburner 4240** offers an internal, plug-and-play 2X CD recorder (and 4X CD-ROM reader) bundled with all the software you need

to burn your own CD-ROMs (800-445-9400) Shinko Technologies' \$8,495 **Color-Stream Digital Printer** offers a protective ultraviolet ribbon and the choice of dye-sublimation or wax-thermal output (510-441-1175).

Software

SolidWorks Corp.'s \$3,995 32-bit mechanical design software, **SolidWorks 96**, has enhanced assembly-modeling, part-modeling, and drawing-generation functionality (800-693-9000) Corel Corp. finally brings the Macintosh market into the fold with **CorelDraw 6 Suite for Power**

Macintosh. The \$595 suite includes CorelDraw 6 and Corel WordPerfect 3.5.1, as well as Corel Dream 3D 6 for 3-D modeling, the Corel Artisan image editor, and more (613-728-0826) Do you have an unwieldy book or video collection? Version 3.0 of Insight Software Solutions' \$25 **SmartTracker Books** (a separate version is available for videos), provides a means for cataloging and searching your collection with ease (801-295-1890) Bentley Systems' flagship CAD package, the \$3,995 **MicroStation 95**, is now available for OS/2 Warp (800-236-8539).



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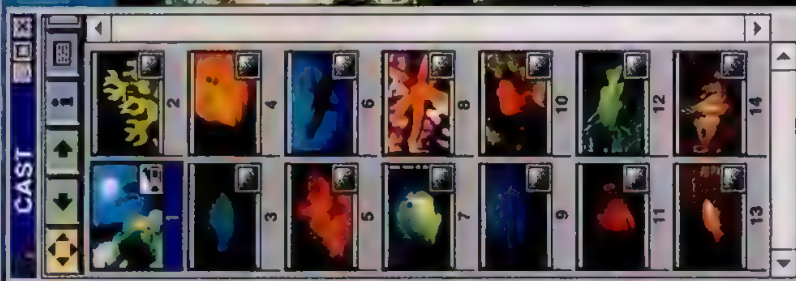
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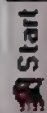
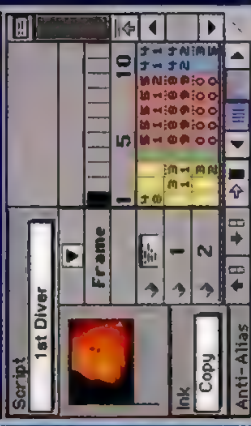
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The Sorry State of Telecommuting

I did my first telecommuting job in 1978, writing code on a computer in Ohio from my home in New Jersey. It was slow going, at 30 characters per second. I used a balky old Anderson-Jacobson printing terminal that ate roll after roll of stinky thermal paper,

17 inches wide, recording my every keystroke in smudgy purple characters. I had a personal computer, which I'd soldered together a year earlier, but I wouldn't buy a Hayes Smartmodem 300 for another year. So AyJay and I remained fast friends.

It wasn't a full-time job, just me working nights and weekends to get a job done for a client. I could call the client's HP 3000 from the office, using a state-of-the-art 1,200-bps modem, but for composing lines of code, connect speed didn't matter. Besides, anyone who's ever programmed knows that those wee, caffeine-fueled hours are valuable for their unbroken concentration and the sleep deprivation-induced altered state of consciousness that seems to get you inside the compiler.

My primitive setup seems laughable compared with today's PCs, the Internet, e-mail, and line speeds that are a thousand times as fast. But despite the seeming sophistication of today's hardware and software, telecommuting is still in its infancy. Yes, I can get my e-mail nearly as rapidly as I would from the server at work, use the network and the attached peripherals, and pick up my voice mail from anywhere in the world. I only have to go into the office for snail mail and meetings. But that three-orders-of-magnitude gain in line speed has done little to improve the work itself.

We keep looking to line speeds as the answer to our remote-commuting problems, but in fact they're no more beneficial to us than faster CPUs. Just as faster processing is consumed by fat operating systems and code bloat, faster line speeds are absorbed by fonts, graphics, attachments, and a host of things largely unrelated to the actual message that promise to make our world better.

Take the Internet and all the things we can do on the Web and Usenet. Yes, we can do an amazing amount of research, discuss anything imaginable, and get opinions that range from expert to wildly uninformed. But we could do that on the commercial services for the last decade or more. The only thing that's different is that we've moved to an advertising-supported model instead of a subscriber-supported model.

That, and all the graphics. Do .GIF animations and Java ticker tapes really improve your lot? Do they make the information easier to get or use? No, but they sure do slurp up that surplus bandwidth. The Web is a four-year-old, endlessly yammering, "Look what I can do!"



BASIC NEEDS

High-bandwidth connections will never replace that most basic human need: contact.

Now we can make terrible-sounding phone calls over the Internet for next to nothing, and we can do terrible-looking personal videoconferencing over a heavily equipped PC. The available bandwidth isn't enough to do them right. Cable modems and digital telephone connections that are another thousand times as fast as today's modems will supposedly make the critical difference. But will they allay the loneliness and estrangement that come with working at home? Today's whiteboard applications that let you share applications often degenerate into tugs of war over who controls the cursor. Will they be replaced by truly collaborative software? Sometimes I feel like a guru on a conference call, my notebook open before me and product information, company backgrounders, and results of complex searches at my fingertips. Other times I feel like a moron, saying to myself, "Gee, if I could just bounce this idea off Ed. . ."

These high-resolution, high-bandwidth connections will never replace that most basic human need: contact. The free exchange of information and ideas is a basic business need. Does a videoconference inhibit the flow of ideas that you get in a face-to-face meeting? It remains to be seen. If I

can chat with Ed on-screen, with enough resolution to see the cocked eyebrow or the laugh lines forming, this technology might just be beneficial. We're close to having digital communications that are a million times as fast as what was available 20 years ago. Will they be a million times as good?

And what about those of us who work in service-related jobs? Will shopping malls become dusty, deserted canyons as we make our purchases from high-resolution images? It seems unlikely, doesn't it?

In the meantime, don't sell your airline or oil company stocks. The great majority of us will continue to commute to work for a long time to come. □



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The Computers-In-Education Fiasco

Educational institutions were early adopters of computer technology, but they have failed to keep pace with even individual PC users. The fact that you can still find decrepit Apple II computers in classrooms is a pathetic indictment of an educational sys-

tem that needs drastic overhauling. Over the years, educational budgets have swelled, and student performance has sagged. More and more money has been siphoned off into administrative overhead. This financial morass has taken its toll on computers in the classroom. Just look at the following comments from the March/April 1996 issue of *Change* magazine.

"For more than 25 years, I've been involved with information technology and education. During most of that time, I (and many of my colleagues) have believed that 'the next 18 to 24 months' would bring revolutionary change in how people teach and learn, through the use of technology or otherwise. Yet we're still waiting for those widespread, dramatic improvements; and we're also still waiting for research results that definitively prove the educational merit of applications of these new technologies" (Steven W. Gilbert, "Making the Most of a Slow Revolution").

"Academic pundits frequently comment that the pace of innovation in higher education can be measured by the 40 years it took to get the overhead projector out of the bowling alley and into the classroom. The (few) pundits who know something about both bowling and technology often add that faculty are now far more likely to find computerized projection systems in bowling alleys than in college classrooms" (Kenneth C. Green, "The Coming Ubiquity of Information Technology").

Much of this may change, though, because of one critical development: the Internet. Surfing the Web is a common activity in schools, where kids fight over who gets to go next. It's as if the lone computer were a carnival amusement ride. Netmania has gotten the attention of those in the educational establishment. "What do we do?" they ask. Meetings and conferences abound.

The solution to all this might just be the much-maligned network computer. Everyone (including myself) has predicted it will be a flop. But it may not be if millions of students have their way and the educational establishment embraces it as a "safe" way to modernize.

If you browse the literature on computers in education,

you'll see a number of trends emerging: collaborative education using computers; experimentation with computer-based instruction; the reemergence of long-distance learning, using computers; an increase in home schooling; a heavy use of e-mail; and proposals for elaborate interschool networks.

Some people are looking at intranet concepts for schools on state- and nationwide bases. Look for new buzzwords like *EduNet* or *IntraschoolNet* to describe this architecture.

Network computers are well equipped to handle all of these developments, with the exception of home schooling, which requires a powerful multimedia machine. In addition, the network computer solves a slew of perceived problems with computers in schools. A destructive virus cannot be introduced to a machine, bootleg software cannot be installed by students, software cannot be illegally copied for use at home, and the machines are inexpensive.

But even at \$500 a crack, network computers will break the financial backs of many school districts if they have to be replaced every few years (as they should be). Current budget thinking must change, as Gilbert argues persuasively: "Higher education institutions need to organize for continual reinvestment in educational uses of information technology for the foreseeable future—to recognize that newer technologies that serve specific teaching and learning needs even better than the previous ones will keep arriving from the information industries, and that

computers that still function perfectly are considered obsolete in two or three years. Traditional educational budgeting and accounting systems don't take these computer obsolescence cycles into consideration or recognize that cumulative costs of software, maintenance, and other support services may be larger than the price of the computer. Colleges and universities need to learn how to treat computing-related expenses as annual operating expenses, and adjust budgets accordingly—and painfully."

Despite its many detractors, the network computer may have a bright future—not on corporate desktops but in the classroom. □



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Inside Track

The day is near when Intel's MMX technology will be fully released to the public. Everything seems to indicate it'll be a winner. Or will it? Suddenly there's a fly in the ointment, as Intel is now rumored to be hinting that the MMX chip, though a 2.9-volt part, will require 9 full watts to power it. **9 watts means heat**, and heat means you can probably forget about seeing an MMX lightweight notebook in 1997. You'd need a fan to operate the thing without melting the case. This heat problem may in part be the real reason that **Intel has decided to push back its ship date** for the MMX chip to early 1997. The company was telling vendors last spring that these chips would be in production by mid- to late-summer 1996. It was assumed that the big public rollout would occur at Fall Comdex.

Intel seems to have fostered the notion that it's the lack of MMX-enabled applications and a so-called OEM backlash against having too many different offerings in the channel that have caused the delays. When I first read this in a trade magazine I laughed out loud. **The day Intel holds back a chip** because OEMs are upset about its marketing or because there are no applications is the day the sky turns black and it rains goat heads. The fact is, most software companies have been working on MMX-enabled software for some time, and most of those products are ready to roll. **So something else is amiss.**

Meanwhile, it looks like Intel can take a breather, because **Cyrix seems to be easily out-marketed**, despite the fact that *PC Magazine* found the Cyrix 6x86-based systems to be faster than equivalent Pentium PCs on Windows 95 applications. Of course Cyrix uses a "P-Rating" on its chips that reflects not an actual clock speed but a chip's performance relative to Pentium processors. Personally, I thought this was a counterproductive strategy, because it makes the Cyrix chips seem equivalent to and not faster than Intel's processors. The strategy may have backfired.

Cyrix has also been targeted by Intel. It's an unproved rumor that Intel puts a vendor on a B-list if it buys any processors from the competition. B, in this case, stands for "Back of the line, buddy" whenever a new chip hits the streets. In a hot market, **this spells trouble**. In the past, **AMD has been the target of similar tactics**, but that company has since fallen by the wayside. AMD was much more adept at fending off such strategies. Gee, you'd think these companies could all get along with one another, huh?

Meanwhile, **Cyrix is sitting on its 586GX**, the perfect chip for the network computer (a topic I discussed in my column in this issue). The problem: Nobody wants to risk building a network computer. I know for a fact that Intel is

The day Intel holds back a chip because OEMs are upset about its marketing or there are no applications is the day it rains goat heads. Fact is, most software companies are ready to roll out their MMX products. Something else is amiss.

not interested in pursuing the low-end market. The 586GX may not be a bad idea if someone can get the network-computer concept off the ground.

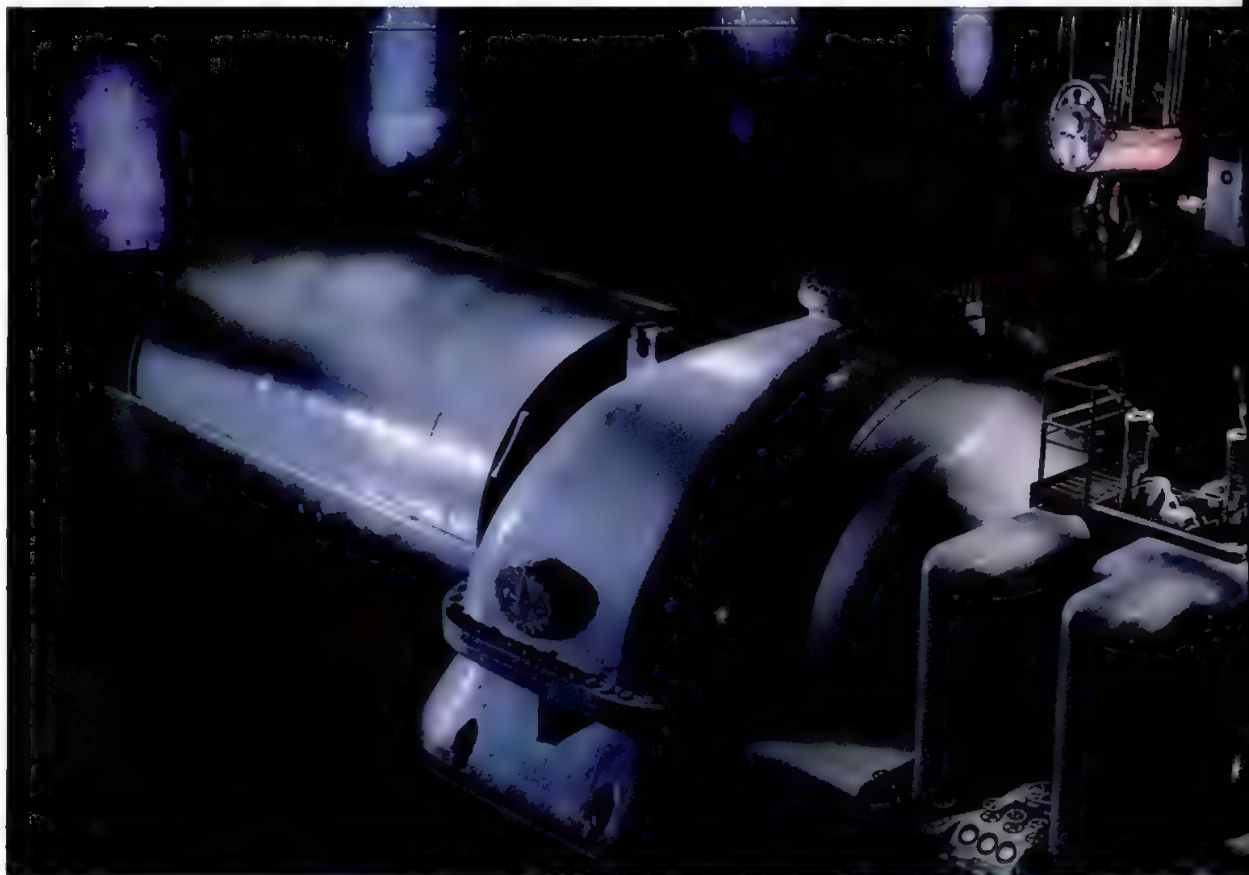
Uh-Oh Dept.: While working on an essay on how telephony on the Internet would be nothing but trouble—besides, I was thinking, to use it every day you'd have to be connected full-time—Mobius Computer Corp. and VocalTec Ltd. announced a scheme to produce an **Internet-to-telephone gateway device** that would let you make a call over the Internet that jumps to a real phone system near the recipient. Imagine a gateway in New York City that transferred calls from the Internet onto Nynex. Anyone from anywhere could use their Internet connection to place a call to New York—for free. If this

doesn't bring the Internet telephony debate to a head, nothing will. Personally, I believe that **the Net is not about telephony** and that such devices are just going to result in unnecessary regulations. But technology marches on.

It Took a Licking Dept.: I can't say exactly when it started, but one day out of the blue my Timex Datalink refused to suck up the data from Microsoft Schedule+. I couldn't help but wonder what would happen if Bill ran into the same problem. The **error was due to a "PC-Watch Mismatch,"** according to the message on the watch's display. This is just peachy, I said to myself as I tried to load the data about 30 times—all to no avail. Worse, when I went to recalibrate the Timex software, the program wouldn't run.

As with most Windows software, if you back up the system and reload Windows and try and run any software, most of it won't work, because the software needs to be reinstalled: The proper pile of DLLs and .INI files have to be placed all over tarnation just so some code will work. Actually, it turned out a **suddenly missing .VBX file** had caused the problem. Who knows where that was supposed to be located? When Windows tells you a file is missing, it never tells you where it expected to find the file in the first place. Is that too much to ask? At least that way I might be able to find the file and put it back where it belongs.

DLLs are a plague, and **Microsoft's implementation is irresponsible**. Microsoft essentially replaces the old overlay files of the CP/M of yesteryear. But the old overlay files were assigned to one—and only one—program, and they usually resided in that program's subdirectory. Most DLLs are in the Windows subdirectory and many are shared by more than one program. The fact that the ancillary programs needed to make a program run are scattered all over the disk is a **pathetic design flaw** in Windows and should be corrected as soon as possible. Meanwhile, I have a **pretty cool watch** that can't do anything—except tell time, of course. □



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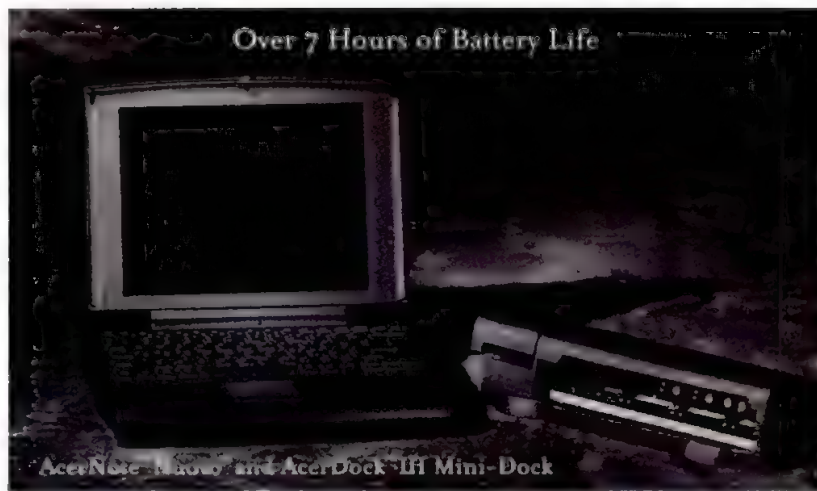


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Why You Don't Use Windows

Do you use windows? Yeah, sure, right? *Everyone* uses Windows these days, eh? But wait a minute: That wasn't what I asked. I didn't ask whether you use Windows, the capital-*W* graphical-interface operating system from Microsoft. I asked

if you use *windows*, the lowercase *w* word. You know: several windows open at once on-screen, overlapping, peeking out from under one another, with instant, one-click access to each of those programs or processes.

You do? I don't believe it.

And I don't believe it because I've looked over your shoulder too often, and I've rarely seen you with more than one window open at a time. Like the rest of us, you usually run applications full-screen, and you switch between open apps with Alt-Tab keystrokes—or worse, you click the little box in the upper-right-hand corner of every window to put it away for a minute so you can click on the Taskbar to bring up another. (Or if you're still using Windows 3.x, you double-click on the minimized icon of the next program you want, or maybe—just maybe—you use the Task List.)

But you don't *use* windows. You just sort of acknowledge their existence.

Okay, so I haven't actually looked over *your* shoulder. But in my wanderings through Corporate America, and as I sit talking and working with thousands of PC users on planes, in airports, at seminars, in their offices, and in their homes, I rarely see people really use windows. With the occasional exception of programmers, who do tend to keep a few windows open at once, and those times I see people briefly open a second window so they can cut something from one document and paste it into another, I've become convinced that very few of us use windows for more than the occasional, *hey, look here!* exception.

And I think I know why: We can't see what's on our screens when we have more than one window open.

This isn't a function of the font sizes we've used in an open document, nor of system-font size, nor of any other technical reason. It's because we don't have enough *screen real estate*. With a window much smaller than full-screen size, we can't see enough of what we're working on. Understanding whatever might appear in any

other window behind or beside that full-screen or nearly full-screen window we're working in would really be hopeless. Sure, with a bigger monitor, we could keep open a realistic-size window for whatever we're working on at the moment, plus two or three smaller, partly

hidden windows for the secondary programs we need. Like a calendar program. Or an e-mail program. Or a spreadsheet app. Or whatever.

But we don't have a big monitor. So we're working within the 640-by-480 or maybe 800-by-600 confines of a notebook's LCD panel. Or on a 15-inch or maybe a 17-inch monitor. At the same resolution. Or cranked up all the way to 1,028-by-768. But still without enough real estate to really *use* windows (or Windows, for that matter).

A modest proposal: A bigger monitor would substantially change how you work at a computer. You'd be more productive. And a lot happier.

I've been recommending big monitors—19-, 20-, 21-inch—for years. It's been a tough sell. High-quality big monitors (and anything less than high-quality guarantees headaches and eyestrain) used to cost a bundle, and they're *huge*. Not long ago, a good 20- to 21-inch monitor ran from \$3,500 to \$5,000, putting it out of the question for office use, unless you stayed in AutoCAD or PageMaker all day long. And those monitors were so deep, you could hardly fit one on a standard desk or credenza,

let alone in the cubicles that have taken over as we've Dilbert-ized business America.

Good news has come on one of those fronts: The price of high-quality big monitors has fallen sharply. Now there are many fine 20- to 21-inch monitors available for around and even just under \$1,500. The drop in prices was no accident: manufacturers' volumes have increased substantially as PC users have caught on to the advantages of big monitors, and that increased volume has driven prices down. Though we still see \$2,500 21-inch monitors, the fat part of the market will be sub-\$2,000, with good \$1,500-street-price 21-inch monitors from all the

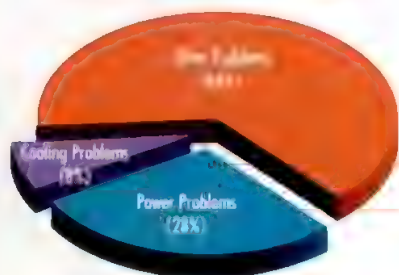


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A modest proposal: A bigger monitor would substantially change how you use a computer.

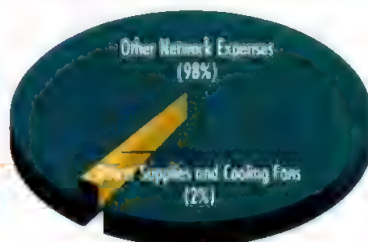
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JIM SEYMOUR

major manufacturers by the end of the year.

I've been working with several big monitors in that price range lately, from Hitachi, Mitsubishi, Nokia, Radius, ViewSonic, and others, and the overall quality level is way up from as recently as a year ago. Misconvergence is evil on 21-inch screens, but none of those I've tried have had convergence problems. My favorite so far, the Nokia 445Xi, is amazingly sharp and crisp, right out into the corners.

We haven't made much progress on the depth front: 21-inch monitors still measure 20 to 23 inches or so from front to back, which will keep them out of many cubicles. Though there has been talk of space-saving innovations (such as folded-path CRTs) for some time, none of those have come to market. My guess is that we won't see serious improvement in the size issue until large, color LCD panels fall a long way in price. And I'm not holding my breath for that.

But if you can fit a 22-inch-deep monitor into your workspace—and if you use your PC more than a couple of hours a day—it's well worth the effort to start working on management to get you a big monitor.

Once you have the monitor on your desk, what resolution should you use? The big-monitor game starts at 1,024-by-768 and goes up through 1,280-by-1,024 to, realistically, 1,600-by-1,280—all, please, at a 75-Hz-or-better refresh rate. Start, if you wish, at 1,024. But you want screen real estate, remember, and if you're already using 1,024 on a 17-inch monitor, you'll gain readability but not much more by choosing 1,024 on a bigger monitor.

My guess is that you really want 1,280. If that makes the system font look too small in window headers, menus, and so on, see if your graphics card will support the semi-standard 1,152-by-864 setting. Once users discover this oddball setting, many stay with it; others use it as a way to get used to the look of a tight, crisp display with fairly small system-font type before heading up to 1,280. You probably don't want 1,600 unless you have very good eyesight and sit close to the monitor.

I know that in the era of the decent \$1,500 Pentium PC, spending that much again on a monitor may sound extravagant. I don't see it that way, and increasingly, my corporate clients are coming around. Spending \$3,000 to \$3,500 on a system that not only performs well but makes users happier and more productive is a good investment, period. □



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Deep Storage

If the 100MB floppy disk was a great leap forward, then the 1,000MB (1GB) "floppy" disk will positively change your life. This is a removable cartridge with the ability to store 500MB to 1,000MB of data. *Floppy* is a misnomer: This disk is closer in

speed, capacity, and technology to a hard disk.

Take the Iomega Jaz cartridge, for example, which spins at 5,400 rpm and stores 1GB. Or the Panasonic PD/CD drive, a combination read-only CD-ROM drive and rewritable 650MB phase-changed drive. Compaq sells it with some of its PC lines, and Panasonic recently introduced a laptop with a PD/CD drive tucked under the keyboard. Then there are magneto-optical drives, which hold anywhere from 128MB for a 3.5-inch device to 2.6GB for a 5.25-inch device. All of these devices cost around \$500.

These fast, removable, 650MB to 1GB cartridge devices coexist nicely with what I think of as high-capacity floppies, the best-known and most popular of which are Iomega's 100MB Zip drive and SyQuest's EZ-135 (135MB) and new EZ-Flyer (230MB). These cost about \$200 apiece, and the prices are falling quickly. There are also the true high-density floppy disk drives of about 120MB capacity, which also read and write to 1.44MB disks. The best known is MKE's LS-120; Compaq currently offers it on desktop PCs. Another 120MB drive, on its way from Mitsumi, will offer better specifications but will not be cross-compatible with the LS-120.

The 1GB fast cartridge devices don't interfere with you or your work: you don't sense any mechanical limitations. Transfer speed is like a hard disk's, on the order of 1MB per second, or 100MB in a bit over a minute. And you don't have to worry about filling them up. You can transfer all your PC's data files onto a single cartridge. On the other hand, with a 100MB device like the Zip, you constantly notice it's slower than a hard disk—4 minutes to fill a 100MB disk, or 10 minutes if you use a parallel port interface. And you have to keep checking for available disk space. The LS-120 is slower still.

Market share matters in this product category, because it determines whether you can swap disks with coworkers and business partners. SyQuest's EZ devices are based on arguably better technology than Iomega's Zip, but you have a better chance of finding a Zip drive on another person's desk. The disks—at around \$15 each—are cheap

enough so that if you send one to a client or a prepress house and don't get it back, it's no great loss. That's not the case with \$50 to \$100 1GB cartridges.

If you're in the market for a removable mass-storage device, here are some suggestions: 1) If you're planning to buy a new PC, get one with such a device already installed—you'll avoid installation hassles and get the drive at a cheaper price than you could've on your own; 2) Internal drives are cheaper than external versions; and 3) Parallel is convenient, but it's *s-l-o-w*. Choose SCSI or Enhanced IDE.

There's been a lot of discussion about whether 100MB devices will replace the floppy disk. Iomega could become a standard because of its market share, but the price (currently \$149 street) needs to get below \$100 for end users or below \$50 for PC vendors. I believe Iomega can do it and still make money.

However, you'll still need a regular 3.5-inch disk drive, which means you'll be using up two drive bays. In comparison, because the 120MB floppy disk drives are backwards-compatible with 1.44MB floppy disks, they require only one bay for both types of storage; they are also a bit cheaper to produce than a Zip or a SyQuest drive. In the longer term (three to five years), you'll also see CDs and DVDs evolve from read-only to write-once (CD-R) and, eventually, to fully recordable.

A few notebook vendors now offer Zip drive options that fit in universal bays.

I'd love to see a lightweight combo external floppy/Zip drive for a subnotebook. Barring that, I'd like to see the LS-120 or the Mitsumi drive offered as a subnotebook option. As for desktop PCs, I'd personally like a machine with a basic floppy disk drive and—if the PC vendor offered it to me for \$99 extra—a 100MB cartridge device so I could swap large files with colleagues. And for my own data storage and archiving, I'd add a 1GB internal cartridge device.

Right now the best bet looks like the Jaz drive, which goes for just under \$400 for the internal version. Once you get all these devices, start saving your money for the cartridges, because it's truly a razors-and-razor-blades business. □



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NETWORK EDITION

25-MBPS ATM ADAPTERS

Power to the Desktop

25-Mbps ATM's reasonable price makes the power of ATM affordable. But is it ready for prime time?



By Robert P. Lipschutz

ATM is at a crossroads. While it is generally accepted as a solution for public and private network backbones, it has not yet proven itself in corporate workgroups. A new crop of low-priced 25-Mbps ATM products, however, makes a workgroup ATM solution practical for certain applications in organizations that run ATM on the backbone. As we found in our testing, and as you might expect, ATM25 adapters outperform Ethernet adapters on the desktop even with today's applications.

ILLUSTRATION BY SAM WARD

INSIDE



You've heard about the promise of ATM for running video, sound, and other high-bandwidth applications over the network. For the past three years, Adaptec,

IBM, and a few other vendors, have been pushing 25-Mbps ATM as a way to get many of the technology's advantages today without breaking the bank. ATM vendors are already coming out with second generation 25-Mbps products.

PC LABS TESTED FIVE 25-Mbps ATM adapters to see how they stack up against their Ethernet cousins. Consultant Rob Lipschutz and Technical Analyst Russ Iwanchuk found that even running LAN emulation these cards easily outperformed 10-Mbps Ethernet adapters.

INTRANET IS ONE of those buzzwords attaching itself to a variety of products. In First Looks, O. Ryan Tabibian examines products from JSB Corp. and Mustang Software. Both come with Web server software. JSB Intranet Jazz adds a set of well-integrated Internet tools and a kiosk application. Wildcat! 5.0 is an interesting combination of Web server and BBS. (Page NE29.)

ISDN ROUTERS ARE GREAT for branch offices, telecommuting or connecting small or home offices to the Internet. Author Les Freed tested a combination ISDN router and hub. The NetRouter 1080 comes with a nice set of security and line-management tools. Contributing editor Steve Rigney reviews a RAID powerhouse from Aiwa. (Page NE31.)

WILL YOU BE GETTING BOTH your phone service and Internet connection from your local ISP? Check out Senior Networking Editor Frank Derfler's Multiple Access column to find out. (Page NE38.)

—Leon Erlanger

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Any discussion of ATM25 must begin with a discussion of ATM technology in general. ATM has two main advantages over the more popular switched and Fast Ethernet. First, ATM scales better, with adapters and switches that run at speeds from 25 Mbps up to 622 Mbps—far surpassing today's Ethernet maximum of 100 Mbps. Gigabit Ethernet is on the horizon, but 622-Mbps ATM products exist today. Also, ATM is a fundamentally switched architecture. It's easier to design an ATM network that avoids bottlenecks than to do so with an Ethernet network. For example, direct connections between two switches on an Ethernet LAN may be shared, while on an ATM LAN they are not.

In the future, applications may directly support ATM, with the ability to reserve just the right amount of network bandwidth for each data, voice, and video application. We expect that the first applications to support ATM will be server clustering, data replication, videoconferencing, and broadcast video applications.

Given the state of ATM today, we think that it fits into a few key areas. First, ATM's guaranteed high bandwidth, even across multiple switches, is perfect for any applications that run video, sound, and graphics over a network—for example, in the entertainment industry. Second, for Token-Ring shops that currently use Type 1 cabling, ATM25 is a logical upgrade because it will not require cable replacement. Finally, ATM25 can connect home users to high-speed networks such as those offered through the cable companies via cable modems. Since the backbone will run ATM, it makes sense to connect the end-station via ATM.

ATM25 is a desktop technology, not a server technology. It provides a lower-priced ATM desktop solution than 100- or 155-Mbps ATM—as low as \$200 per adapter, or \$500 per connection. It works with desktop operating systems such as Windows NT, Windows 95, and Windows for Workgroups (see Summary of Features) over Category 3 UTP or STP cabling.

ATM25 ADAPTERS

We tested five ATM25 PCI adapters—the Adaptec ANA 5910DX PCI Adapter, FORE Systems ForeRunnerLE 25 Mbps PCI Bus ATM Adapter, IBM Turboways 25 ATM PCI Adapter, Interphase 5525 PCI ATM Adapter, and Madge Networks Collage 25 PCI Adapter—using a White-tree WS3000 Workgroup Switch running Ethernet LAN emulation services and

Madge Network Collage 25

All of the products we tested except the Adaptec ANA 5910DX installed relatively easily and performed well. But the Madge Networks Collage 25

PCI Adapter stood out from the pack.

The Collage 25's painless installation consisted merely of using the Windows NT control panel to add the bundled driver and choosing LANE type and MTU size from a series of intuitive pop-up screens. Only one emulation client is installed, so there is no need to type in multiple dummy IP addresses. The Collage 25's performance was also the best among the products we tested.

Close behind the Collage 25 were the IBM Turboways 25 and FORE Sys-

tems ForeRunnerLE. Both also showed good performance and easy installation, though the FORE product lacks Token-Ring LAN emulation and the IBM only allows one ELAN per adapter.

Organizations on a budget should take a close look at the Interphase 5525. At \$222, it was the lowest-priced card in the bunch, yet its performance was not appreciably inferior to that of the other products tested.

The only adapter that gave us trouble was the Adaptec ANA 5910DX.



Windows NT 3.51 Workstation.

Although we can appreciate the complexity of ATM software, we preferred an adapter that was easy to install. These are desktop adapters, so ideally they should be as easy as to install as Ethernet adapters. Any complexity should be hidden from the user. We used our NIC Throughput tests from NetBench 5.0 to see what type of performance we could get out of these 25-Mbps adapters. We found throughput as high as 16 to 18 Mbps for the large block sizes common in large data or video transfers—twice as fast as an Ethernet adapter.

Configuring each of the adapters required using the Windows NT Networking Control panel to install the ATM and LAN emulation drivers. This was either a one- or a two-step process, depending on the product. All of the adapters supported Interim Local Management Interface (ILMI), which lets the adapter learn its ATM address from the ATM switch when it is initialized.

WHAT ATM OFFERS

Quality of service (QOS) has long been the calling card of ATM. Quality of service refers to the ability of endstations to request and get the bandwidth they need from the ATM network, and the ability of the ATM network to manage bandwidth efficiently for all endstations. Unfortunately, today's ATM products don't yet have effective QOS built in.

Available Bit Rate (ABR) service, a part of the Traffic Management 4.0 specification that the ATM Forum expects to be com-

plete by the end of 1996, will enable applications to interface with ABR-ready adapters in order to request bandwidth. Applications will also know how to give bandwidth back to the network when required.

Today's ATM adapters simply open up a full-bandwidth—25 Mbps in the case of ATM25—virtual circuit whenever they open a connection. This is called an *Unspecified Bit Rate* (UBR) connection. There is no way to throttle a UBR connection. In essence, during very busy periods, the network will drop information much as an Ethernet network does today.

Some intelligent congestion control is done today in ATM switches. Switches do what's called *early packet discard* to drop cells efficiently in a congested ATM network. The switch attempts to drop cells from the same packet so as to affect the minimum number of communications in a congested network.

ATM NEEDS APPLICATIONS

Ethernet and router proponents aren't waiting for ATM to mature. Ethernet switching was the first step, and then came Fast Ethernet running at 100 Mbps; next, new technologies and initiatives aim to make routed networks even more usable for multimedia applications. Gigabit Ethernet is on the drawing board, and there are new multicasting standards being worked out so that video can be transmitted efficiently across enterprise networks. Cisco Systems, 3Com, and others are

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	FE-506	5	6
	FE-210	2	10
	FE-106	1	6
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HOW WE TESTED

ATM25 Adapters



Running the new ZD NetBench 5.0, we tested five 25-Mbps ATM adapters. They easily outperformed 10Base-T Ethernet adapters. Real-world performance may vary depending on your application.

What the Numbers Mean

On our tests, Madge Networks' Collage 25 led the pack, followed by FORE Systems' ForeRunnerLE, IBM's Turboways 25, Adaptec's ANA 5910DX, and Interphase Corp.'s Interphase 5525. The range of performance was relatively small: For most block sizes, the Interphase 5525's performance was about 90 percent as fast as the Collage 25's, but in no case was it less than 80 percent as fast.

For this review, we used our NetBench NIC Throughput test to examine the performance of the adapters with five data block sizes: 64 bytes, 4K, 16K, 32K, and 64K. The highest throughput number was 17.67 Mbps. We attribute this to bandwidth being used by Windows NT networking and LAN emulation.

Hardware chip set and buffer memory determine the basic performance quality of an ATM adapter, but the ATM driver and LAN emulation software implementation is also an important factor. Each new version of a driver tends both to be more optimized for performance than the last and to have fewer bugs. So we suggest downloading and using the latest device drivers from the Web site or BBS of your ATM adapter vendor.

A typical ATM workgroup LAN setup consists of clients with 25-Mbps ATM adapters and servers with 155-Mbps ATM adapters. We designed our test-bed to measure the performance of these 25-Mbps ATM adapters as client NICs.

In additional throughput tests, the server, which was equipped with two 133-MHz Pentium CPUs, reported healthy CPU utilization numbers when tested with one client. As we added clients during testing, the processor started to strain under the load. Installing faster CPUs (such as Pentium Pro CPUs) in the server could help increase the overall performance and scalability of your ATM network.

Analysis written by Alex Ho

NIC Throughput

Megabits per second	64-byte blocks	4K blocks	16K blocks	32K blocks	64K blocks
Adapter ANA 5910DX	4.92	9.64	14.71	16.40	16.76
ForeRunnerLE	5.10	9.84	15.47	16.72	17.11
IBM Turboways 25	5.03	9.89	15.07	16.24	16.57
Interphase 5525	4.87	9.15	14.67	15.40	15.39
Madge Collage 25 PCI	5.21	10.94	16.04	17.33	17.67
Ethernet 10Base-T adapter*	3.85	6.26	7.63	7.76	8.00
	BETTER ►	BETTER ►	BETTER ►	BETTER ►	BETTER ►

* Intel EtherExpress PRO/100 Smart PCI (reported for comparison).

How We Tested

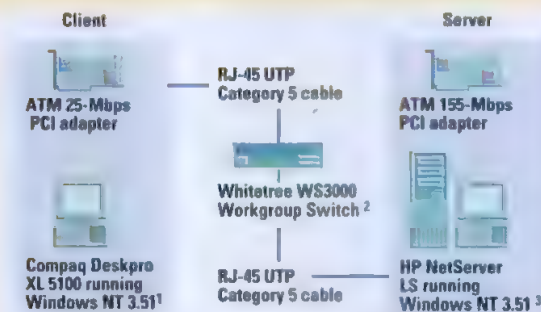
We used a Whitetree WS3000 Workgroup Switch running Whitetree LAN emulation service (LANES) as the backbone of our test-bed, and a 1.5K MTU.

Our server was an HP NetServer LS with dual 133-MHz Pentium CPUs, 128MB of RAM, and a 4GB hard disk, running Windows NT 3.51 Server. Our client was a Compaq Deskpro XL 5100 with a 100-MHz Pentium CPU, 16MB of RAM, and a 1GB hard disk, running Windows NT 3.51 Workstation.

We installed each vendor's 25-Mbps ATM PCI adapter in the client and its 155-Mbps counterpart in the server. We then connected the client and the server to the Whitetree switch using Category 5 RJ-45 UTP cables.

Our NetBench 5.0 NIC Throughput tests measured the maximum throughput of each of the 25-Mbps ATM adapters by sequentially reading data from a test file in the server's cache.

We used a 32MB test file that was small enough to fit in



(1) Pentium/100 CPU, 16MB RAM, 1GB SCSI hard disk (2) Running Whitetree's Ethernet LAN emulation service (LANES) (3) Two Pentium/133 CPUs, 128MB RAM, 4GB hard disk

TEST-BED: ATM25 adapters.

our server's cache but big enough to avoid being cached at the client. The 25-Mbps ATM adapter's activity was then isolated from the performance of such other hardware components as hard disk speed and client cache.

We specified block sizes to be read from the test file. NetBench reported the throughput results in megabits per second.

For comparison, we used an Intel EtherExpress PRO/100 Smart PCI adapter in our HP server, and the on-board 10Base-T adapters in our Compaq client. We connected them with a Cabletron SynOptics 28115 100Base-T hub and ran the same NetBench tests.

Stephen Goudreau
*Manager of East Coast Operations
Bay Networks, Inc.*

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E-mail: hdeloraine@unc.edu*

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Matrix-UPS:

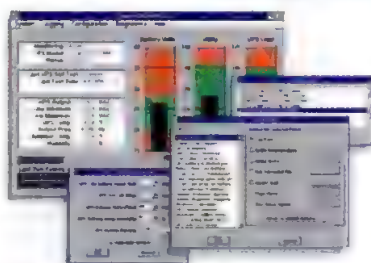
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The Pipe Not Taken

Choosing among the options for connecting desktop computers to the LAN can be a difficult undertaking. Not only do you need to choose a desktop adapter, you must make a decision about the network hub or switch that ties all the desktops and servers together.

Common sense tells us that a faster pipe is better than a slower pipe and a switched solution usually beats a shared one. If only it were that easy! A problem many network administrators are grappling with right now in comparing switched Ethernet with shared Fast Ethernet is deciding between a slow switched solution and a fast shared solution. There are many components you must assess when making a buying decision.

Ethernet and Token-Ring adapters—the workhorses of

most LANs—can serve ably for users requiring only occasional files or printer access from the network. Shared Ethernet hubs (also called concentrators or multiport repeaters) handle most of the LANs today. Token-Ring networks use MAUs and CAUs to provide a structured wiring solution for the logical rings. Token-Ring is available in both 4- and 16-Mbps variants.

You can extend the useful life of your Ethernet network by adding Ethernet switches to segment traffic dynamically in your network. The same thing can be done with Token-Ring switches, although this kind of switch is quite a bit more expensive. Remember that a switch not a wise purchase if all or most of your traffic is going to one server, because the connection between the server and switch won't be any faster than 10 Mbps.

Connectivity Options

	Benefits	Drawbacks	Cost per connection
Shared Ethernet	No equipment change required.	Low bandwidth; collisions.	\$150 to \$200
Switched Ethernet	No adapter change required on Ethernet client; no collisions; dynamic segmentation.	No benefit with single server; limited scalability.	\$300 to \$500
Shared Fast Ethernet	10/100 adapters are low in price; works with high-speed networks.	Collisions on shared network; 100Base-TX requires Category 5 UTP; 100Base-T4 can use Category 3 UTP but is not yet common.	\$300 to \$500
Switched Fast Ethernet	High-speed switched connection; no collisions.	Expensive.	\$500 to \$800
Shared Token-Ring	No collisions; 16 Mbps available per desktop.	Expensive.	\$250 to \$400
Switched Token-Ring	Multiple conversations (tokens) can occur at the same time.	Expensive.	\$1,000 to \$1,500
25-Mbps ATM	Lower cost than 155-Mbps ATM; essentially a switched network; uses Category 3 UTP.	Current applications don't get the full quality-of-service benefit of ATM.	\$500 to \$700
155-Mbps ATM	Highest-speed desktop connection; essentially a switched network.	Expensive; current applications don't get the full quality-of-service benefit of ATM; requires fiber or Category 5 UTP.	\$1,000 to \$1,300

working on routers and switches to put in bandwidth reservation and congestion management protocols as well.

The key difference is that current ATM adapters and switches have or will soon have all of these features built in—if only the applications will take advantage of them. The sad truth is that no off-the-shelf applications today take advantage of ATM's full offerings. Today it's about making ATM work with existing applications and networks using LAN emulation. ATM's future depends on applications and operating systems working natively on ATM.

LAN emulation (LANE), an ATM Forum standard, provides ATM compatibility for all network protocols, including AppleTalk, IPX, and TCP/IP. LAN emulation works by fooling applications and the network protocol into thinking it has an Ethernet (Ethernet LANE) or Token-Ring (Token-Ring LANE) adapter installed. Ethernet LANE is supported by every adapter vendor, and most had Token-Ring LANE, an important consideration for Big Blue shops making the transition to ATM.

All of the adapters we tested except the IBM Turboways 25 ATM PCI adapter

If you have multiple servers, or a lot of peer-to-peer networking, a switch can significantly reduce network collisions. If you have a single server, you may want to purchase a switch that has Ethernet ports for desktops either directly attached or attached through a hub and a single Fast Ethernet port for the server.

In case you need more bandwidth for your desktops, you have a choice: ATM in 25 Mbps or 155 Mbps, 100-Mbps Fast Ethernet, or 100VG-AnyLAN. Fast Ethernet and 100VG-AnyLAN can provide significantly better network adapter performance than Ethernet. We've seen throughputs of 70 Mbps at PC Magazine Labs, compared with Ethernet's 7 Mbps. ATM can take you even higher.

Depending on the specific needs of your users, you might choose to use more than one of the options we have reviewed for your department or company.

Make wise choices. Don't give a word processor an ATM adapter, and don't hinder your video and graphics users with shared Ethernet.

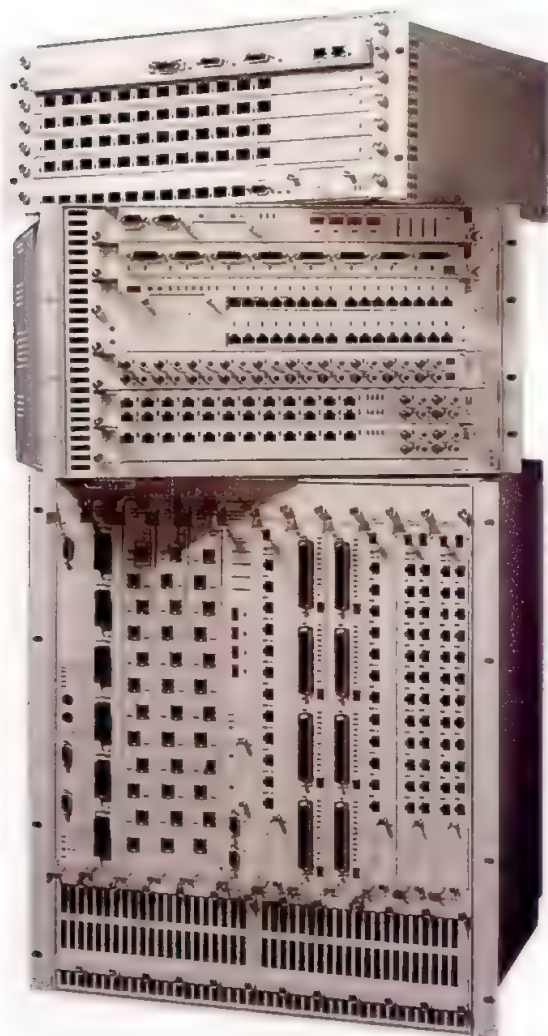
—Robert P. Lipschutz

could connect to multiple emulated LANs—or ELANs—from a single adapter. This is important for organizations with multiple ATM and hybrid ATM/Ethernet workgroups. All supported the 1.5K Maximum Transmission Unit required for bridging Ethernet with ATM. IBM and Madge also supported the three other ATM MTU sizes: 4.5K, 9K, and 18K. Adaptec supports only 1.5K and 9K. Using an MTU size larger than 1.5K gives you better performance but hinders interoperability with legacy Ethernet networks.

Unfortunately, LAN emulation is really only a compatibility patch and does not

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LAN/WAN Switching and Routing

The Infinity's switch chassis provides high-speed switching and routing modules for Ethernet, Token Ring, FDDI and ATM standard-based networks. The flexible design of the Infinity makes it the only enterprise switch chassis on the market that supports shared media modules, switched media modules, and routing modules all in the same reliable, fault-tolerant switch chassis.

Interchangeable Network Modules

The Infinity's family has three switch chassis sizes: a 4-slot for small sites of 12-192 users, a 7-slot for 12-366 users and a 12-slot for 12-576 users. The Infinity's networking modules are unique because they have a universal, re-deployable, scaleable and interchangeable design that is compatible with all three chassis sizes. This flexibility means that network managers only need to keep one set of spares for the entire network, reducing their network's cost-of-ownership by 66%.

Network Security

Security is one of the Infinity's strongest benefits. Network security is provided using several layers of protection. The Infinity uses encryption/scrambling features to provide a primary layer of defense. Additional layers are built using SNMP management and RMON capabilities. Security Logs can be built to record many different network events to a file that can be used any time to trace every packet to its originating physical port.

Advanced SNMP/RMON Management

In addition to security, the Infinity's management makes it possible to prevent network failures before they happen. The Infinity's management module provides better functionality than a protocol analyzer. Instead of sending several experts to different sites with analyzers to collect data after a problem has occurred, one expert can proactively perform a multi-segment, 7-layer protocol decode on data packets from a centralized location before a problem occurs.

No Single Point-of-Failure

The Infinity enterprise switch does not have a single point-of-failure. Each switch chassis has multiple backplanes that carry data traffic and a control backplane for out-of-band management traffic. Each switch module is slot-independent, which means the loss of one or more modules will not affect the rest of the network's operation. The switch also features load-balancing power supplies, redundant data paths and hot swappable modules.

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provide the major benefit of ATM: quality of service.

Two efforts are underway to provide a standard application programming interface (API) for native ATM applications. The new version of Windows Sockets 2.0 has extensions for ATM and will provide a suitable interface for Windows for Workgroups, Windows 95, and Windows NT applications.

The XOpen XTI interface will provide an API for Unix and Macintosh applications. FORE Systems recently announced an agreement with Apple to use the XTI interface with the Apple operating system. No one buys APIs, though, and until real applications are available, ATM will remain just another big pipe.

While we need standards for these APIs, vendors already have to keep up with more than 50 standards documents that either have been completed or are under consideration by the ATM Forum.

We have to think that if ATM is in your future, ATM25 is as well. With its low cost and its compatibility with existing cabling, it will find its way onto desktops. The question is whether ATM is in your near or long-term future.

Adaptec Inc.

ANA 5910DX PCI Adapter

The Adaptec ANA 5910DX PCI Adapter works with a number of desktop operating systems and showed decent performance on our benchmark tests. Unfortunately, a tricky installation and intermittent problems during testing prevent us from recommending the current product. According to the company, an upcoming release of Adaptec's drivers for the ANA 5910DX that will fix these problems should be available by the time you read this.

As with the other products we tested, setting up the ANA 5910DX consists of using the Microsoft Windows NT Network control panel to install the ATM and LAN emulation drivers. What may prove confusing to some users, however, is that Adaptec's routine requires the insertion of a dummy TCP/IP address as a placeholder and the enabling of Classical IP even if you intend to use LAN emulation.

Another installation quirk has to do with the LAN emulation driver's support for four simultaneous ELANs under Windows NT. Most of the adapters we tested automatically name the first ELAN "default." Adaptec leaves the field blank, so you must insert "default" manually in order to join the default LAN.

Once we had finished installation and

SUMMARY OF FEATURES

ATM25 Adapters

PC MAGAZINE
NETWORK EDITION
EDITORS' CHOICE

	Adaptec Inc. ANA 5910DX PCI Adapter	FORE Systems Inc. ForeRunnerLE 25Mbps PCI Bus ATM Adapter	IBM Corp Turboways 25 ATM PCI Adapter	Interphase Corp. Interphase 5525 PCI ATM Adapter	Madge Networks Collage 25 PCI Adapter
■ YES ■ NO					
List price	\$349	\$295	\$295	\$222	\$295
Hardware					
STP/UTP interface	■ ■	■ ■	■ ■	■ ■	■ ■
Buffer memory	512K	128K	9K	128K	128K
FCC class A/B certification	■ ■	■ ■	■ ■	■ ■	■ ■
ATM Adapter Software					
Minimum RAM required for Windows NT installation	16MB	16MB	16MB	16MB	8MB
One-step installation	■	■	■	■	■
Maximum ELANs per adapter	4	16	1	4	8
Supports SVCs	■	■	■	■	■
Provides statistics-viewing application	■	■	■	■	■
LAN Emulation Client					
Ethernet/Token-Ring	■ ■	■ ■	■ ■	■ ■	■ ■
MTU sizes supported	1.5K, 9K	1.5K	1.5K, 4.5K, 9K, 18K	1.5K, 4.5K, 9K	1.5K, 4.5K, 9K, 18K
Supported Standards					
Classical IP over ATM	■	■	■	■	■
Bridged Ethernet	■	■	■	■	■
UNI 3.0/3.1 signaling	■ ■	■ ■	■ ■	■ ■	■ ■
Compatible Operating Systems					
Windows NT 3.51 platforms	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
x86/Alpha/PowerPC	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
Windows 95 (NDIS 3.0)	■	■	■	■	■
Windows for Workgroups 3.11	■	■	■	■	■
OS/2 Warp Connect	■	■	■	■	■
DOS 6.22	■	■	■	■	■
Mac OS/Open Transport	■ ■	■ ■	■ ■	■ ■	■ ■

started testing the product, we ran into more problems. Our test PC sometimes wouldn't boot the first time, and the servers on the network weren't always visible right away. We were not able to determine for sure whether the adapter was the cause of the problem, but we did not have the same problem with any of the other products in our roundup.

The ANA 5910DX was an average performer on our tests. Its 16.8-Mbps peak time would be more than sufficient for running simultaneous video and data sessions. The 512K of RAM that came with our test adapter did not seem to boost performance over that of the other products. A more cost-effective option may be the Adaptec ANA 5910LE (\$199 list), a 128K version.

The ANA 5910DX provides drivers for DOS/Windows 3.x, Windows 95, Windows NT, and OS/2 Warp Connect. In addition

to the 25-Mbps PCI adapter we tested, Adaptec offers 25-Mbps adapters for the MCA, and SBus expansion buses and 155-Mbps adapters in PCI and SBus.—Robert P. Lipschutz

ANA 5910DX PCI Adapter. List price: \$349. Adaptec Inc., Milpitas, CA; 800-442-7274; fax, 408-957-7150; www.adaptec.com. Circle 961 on reader service card.

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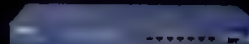
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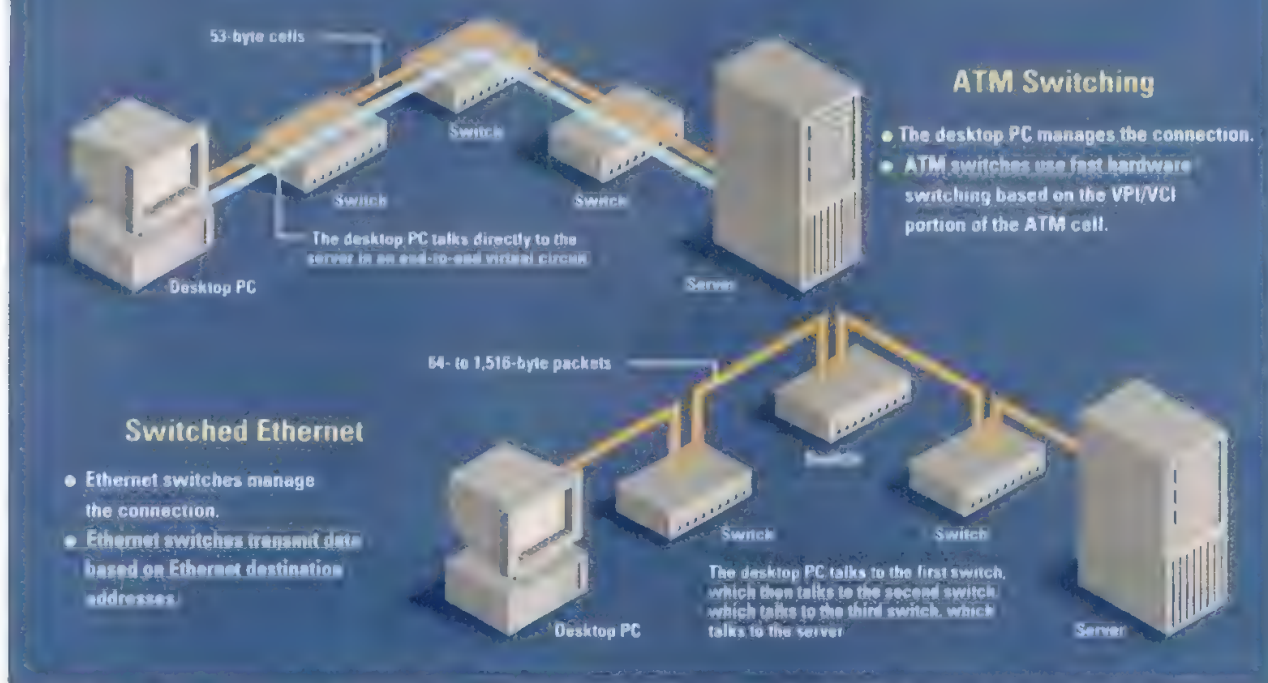
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ATM vs. Ethernet



worthy addition to the FORE line.

The ForeRunnerLE comes standard with 128K of buffer RAM and drivers for Microsoft Windows 95, Windows NT (on Intel and non-Intel platforms), and OS/2 Warp Connect. Noticeably absent are drivers for DOS and Windows for Workgroups. If you are using applications that require ATM25, however, you probably need a 32-bit operating system anyway.

Installation is straightforward. As with the IBM and Adaptec products we tested, it's a two-step process that consists of installing the adapter and LAN emulation drivers separately. The included ForeThought 4.0 software comes on a CD-ROM and includes the installation program, drivers, and online documentation. You can set up multiple ELANs (up to 16 are supported on Windows NT) by installing multiple copies of the LAN emulation software.

On our tests, the ForeRunnerLE's performance was second only to the Collage 25's. The ForeThought 4.0 software currently uses Ethernet LAN emulation only with a 11.5-byte MTU. Later this year, FORE Systems promises to deliver Token-Ring LANE and larger MTU sizes for Ethernet LANE.

We used a Whitetree WS3000 Workgroup Switch on our tests. FORE Systems, however, offers an entire ATM solution

tied together with its ForeThought 4.0 software suite. A full selection of both fiber and copper switch modules are available in speeds ranging from 1.5 Mbps to 622-Mbps OC-12.—RPL

ForeRunnerLE 25Mbps PCI Bus ATM Adapter. List price: \$295. FORE Systems Inc., Warrendale, PA; 412-772-6600; www.fore.com. Circle 962 on reader service card.

IBM Corp.

Turboways 25 ATM PCI Adapter

Even when other vendors were dismissing ATM25 as a passing technology, IBM was its largest proponent. Like FORE Systems and Madge Networks, IBM has developed an extensive ATM product line that includes ATM switches with LAN emulation services. So it came as no surprise that the Turboways 25 ATM PCI Adapter is user-friendly and a solid performer.

Unlike most of the other products in our roundup, which have two-step installations, the Turboways 25's involves only one step: choosing LAN emulation. We were up and running as soon as we set our LANE parameters.

IBM's LANE client software gives you

the option of running in enhanced mode, which protects existing connections even if the LAN emulation services go down.

The Turboways 25 comes with drivers for Microsoft DOS/Windows 3.x, Windows NT 3.51, and OS/2 Warp Connect. It offers both Ethernet and Token-Ring LAN emulation and supports all four standard MTU sizes. The software, however, can handle only a single emulated LAN.

We tested the product under Windows NT, using Ethernet LAN emulation. IBM also has ISA, MCA, and SBus adapters available, and the company is working on drivers for AIX and Windows 95.

The adapter itself is a small half-height card with 16K of RAM. Though this is much less RAM than the 128K to 512K that comes with the other adapters in this roundup, the Turboways 25's performance was not affected. It was close on the heels of the Madge and FORE Systems products, peaking at 16.6 Mbps with our large 64K block size.

Ease of use and good performance make the Turboways 25 a sound investment for those who want to link their multimedia desktops to an ATM backbone.—RPL

Turboways 25 ATM PCI Adapter. List price: \$295. IBM Corp., Research Triangle Park, NC; 800-426-3333; fax, 800-426-4329; www.ibm.com. Circle 963 on reader service card.

Interphase Corp.

Interphase 5525 PCI ATM Adapter

Although it came in last on our benchmark tests, the Interphase 5525 PCI ATM Adapter's performance was not significantly lower than that of the other products in this roundup. At a list price of \$222, the Interphase 5525 makes a viable solution for organizations on a budget.

In addition to the Ethernet LAN emulation software for Microsoft Windows NT Workstation 3.51 that we used to test the Interphase 5525, the product comes with LANE drivers for Solaris x86. Interphase says that drivers for Windows 95, Windows for Workgroups, and OS/2 will be available by the time you read this.

Like IBM's Turboways 25, the Interphase 5525 has a simple, one-step installation: You need install only the LANE driver software using the network applet on



The Interphase 5525 PCI ATM Adapter is an inexpensive option.

Windows NT's control panel. The Ethernet LANE driver can use three MTU sizes: 1.5K, 4.5K, and 9K. Interphase also has Token-Ring LANE software using 4.5K and 9K MTUs.

The installation software defaults to installing four LANE clients. Windows NT requires each virtual client to have its own

IP address, so we had to type in three dummy IP addresses for each adapter we installed. Users installing more than a couple of these adapters will find this annoying.

Another minor complaint we had with the product affects only those who use Windows NT's Event Viewer. Even when operating normally, the Interphase 5525 spews dozens of information, warning, and error-event details to the event log every time Windows NT comes up.

Peaking at 17.7 Mbps with a 64K request size, the Interphase 5525 turned in throughput results about 10 percent slower than our best performer, Madge's Collage 25.

Despite a few quirks and slightly less than stellar performance, the Interphases 5525 PCI ATM Adapter gets the job done inexpensively.—*Russell Iwanchuk*

Interphase 5525 PCI ATM Adapter. List price: \$222. Interphase Corp., Dallas, TX; 800-327-8638, 214-654-5000; fax, 214-654-5500; www.iphase.com. Circle 964 on reader service card.

MOVING?

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Madge Networks Inc.

Collage 25 PCI Adapter



Boasting user-friendly installation, smooth operation, and unsurpassed performance, Madge Networks' Collage 25 PCI Adapter (\$295) is our Editors' Choice winner and an adapter to be reckoned with.

The Collage 25 comes with 128K of SRAM and has a high degree of silicon integration, as evidenced by the single SAR chip. It is available in an STP version, in addition to the UTP copper version we tested.

The Collage 25 led on our benchmark tests, topping out at 17.67 Mbps with a 64K request size. But what we found more impressive than its performance, which was not dramatically better than its competitors', was the Collage 25's painless Microsoft Windows NT installation. Just like the Interphase and IBM adapters, the Col-



The Collage 25 PCI Adapter is impressive all around.

lage 25 has a one-step installation process that is as simple as adding the driver from the network applet on the Windows control panel. An intuitive series of pop-up screens provide options for entering MTU size and LANE type.

The Collage 25 requires that only one LAN emulation client be installed, which means only one IP address to type in if you're using TCP/IP. The Adaptec and Interphase adapters we tested defaulted to the ELANs and required dummy IP addresses for every LANE client on the machine.

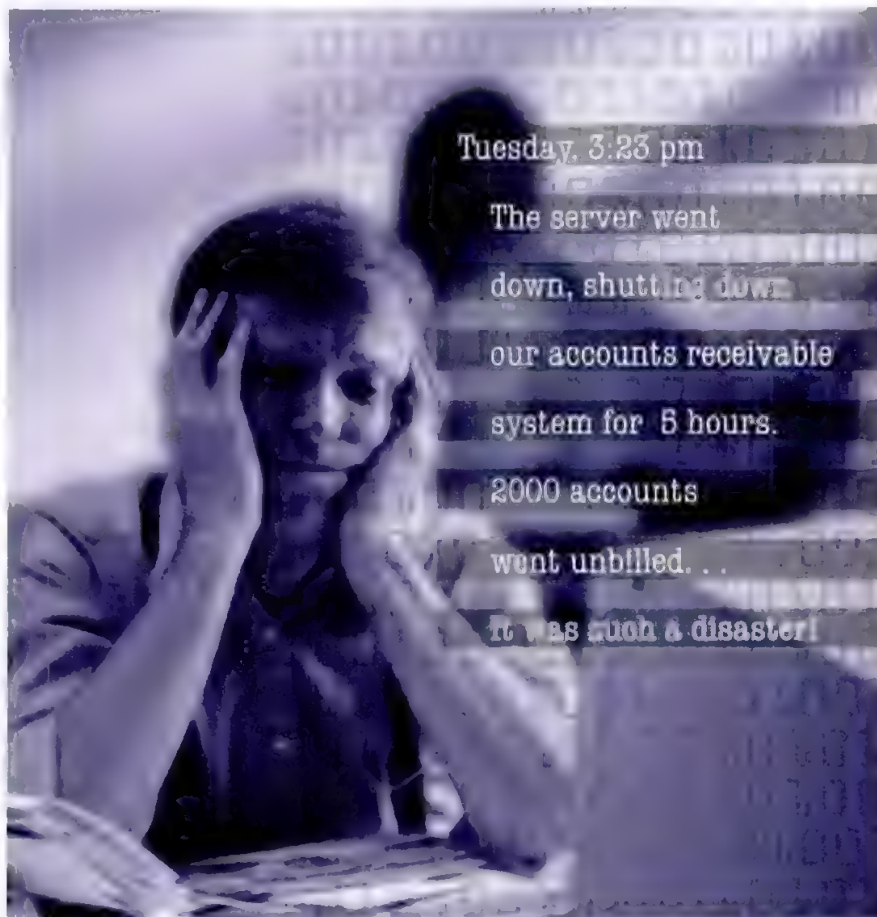
The Collage 25 covers a lot of ground with its diverse operating-system support. There are drivers for DOS, Windows 95, Windows NT (both Intel x86- and PowerPC-based), Windows for Workgroups, and NetWare (Versions 3.12 and 4.1). Madge also provides Token-Ring LAN emulation. The adapter has MTU sizes of

1.5K, 4.5K, and 9K for both Token-Ring and Ethernet. Madge also manufactures 155-Mbps SONET adapters, ATM switches, and access devices, providing an end-to-end ATM solution.

With its competitive pricing, impressive performance, and intuitive software,

Madge's Collage 25 is an unbeatable ATM adapter solution.—*RI*

Collage 25 PCI Adapter. List price: \$295. Madge Networks Inc., San Jose, CA; 800-876-2343, 408-955-0700; fax, 408-955-0970; www.madge.com. Circle 965 on reader service card.



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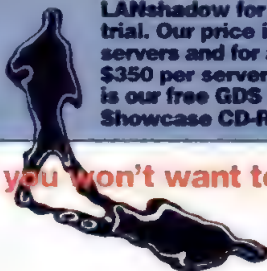
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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

INTRANET SERVERS

Intranets Revisited

By O. Ryan Tabibian

Something old, something new, something borrowed, something blue. This familiar phrase couldn't be more appropriate than when applied to the fast-moving field of computer technology. Though it's true that new products are constantly hitting the market, sometimes the best ones aren't really new; they're expansions of existing solutions.

In this head-to-head comparison, we look at Intranet Jazz, from JSB Corp., and Wildcat! 5, from Mustang Software. These two products have taken existing technology or a set of products and built on it to offer solid Internet and intranet solutions.

JSB Corp.

Intranet Jazz

While much of the computing world was watching the rapid growth of the Internet, a curious thing happened: A market for internal Web sites now known as intranets grew up and now accounts for the majority of new Web servers deployed. Intranets, though similar to the Internet, require a different set of tools, which has resulted in a plethora of products. Among them is JSB Intranet Jazz—a collection of Internet utilities, a Web server, and a kiosk application—that by building a standard, customized interface allows you to simplify the creation of your intranet and the distribution of information.

Installation and configuration of Intranet Jazz was simple and straightforward. We were up and running in a matter of

minutes. The configuration of the kiosk, however, proved more challenging, and we found the instructions inadequate. But with a little perseverance, you should be able to create a stunning interface and pages.

The client portion of Intranet Jazz is a set of Internet tools that includes a terminal emulator, Web browser, file transfer utility, and a POP3 mail client. Many of these tools are standard on both

launch the browser and enter the appropriate URL manually.

The server is a standard HTTP server that runs as either a Windows NT service or a Windows 95 application. It offers many basic Web server functions and adds some advanced features, such as multihoming, which lets you create multiple Web servers with different IP addresses on the same server.

But the most impressive part of the product is the kiosk, which lets you build custom intranet clients. You can configure the kiosk so that it spans an entire computer screen, and you can

tain the unified interface can use the Organizer application. Organizer, which is similar to file manager in Windows, lets you provide a central interface for all network resources.

Intranet Jazz did have a few bugs that caused a number of crashes. JSB is working on fixes, however, and a patch should be available from the JSB Web site by the time you read this.

Intranet Jazz is a viable solu-

KIOSK VIEW: The Intranet Jazz's kiosk lets you build a customized interface for the desktop.

Click a hotspot to start an application or right click for options



Microsoft Windows 95 and Windows NT, but JSB has added value by providing tighter integration between the products and Microsoft OLE 2 and active URL technology.

By using OLE 2, all JSB applications can easily communicate with one another. Active URLs allow administrators to create rules so that external applications can be launched. For instance, with a telnet application, an administrator can simply embed a rule so you can launch the browser by clicking on a specific URL within telnet. This feature is unique to JSB and eliminates the need to

embed hot spots in the interface. The hot spots contain either such standard Internet applications as telnet and FTP, or specific in-house applications, along with other Web addresses. The benefit is that administrators can specify the necessary Internet and intranet applications on the desktop, while disabling the user's ability to enter a restricted URL or load an application.

Furthermore, you can create a single interface for all users on the network, whether they're running Windows 3.11, Windows 95, or Windows NT.

Users who need a higher level of network access yet want to re-

tion for administrators looking to offer a unified interface to clients, either with the use of a kiosk or Organizer. It also provides some impressive integration between applications, which should prove beneficial to most users.

Intranet Jazz. List price: \$995. JSB Corp., Scotts Valley, CA; 408-438-830; fax, 408-438-8360; www.intranet.co.uk. Circle 952 on reader service card.

Mustang Software Inc.

Wildcat! 5.0

Thanks to the popularity of the Internet, the market for BBS software is going the way of the dinosaurs. Vendors that provide tools for BBS operators now find themselves with diminishing markets—but not resourceful vendors like Mustang Software. The company has revitalized its Wildcat! BBS software as a 32-bit application that keeps its old capabilities (like handling callers with simple terminal programs) while adding essential new ones (such as HTML functionality and Web browsing).

Mustang has also turned Wildcat! into a product that is

NETWORK EDITION

First Looks

particularly well suited for corporate intranet systems. It includes a proprietary client/server

terminal program called Navigator, which works well in the mix of older and less powerful computers. Wildcat!, though, is most appealing for existing Wildcat! sites wanting to publish content on the Web, as well as for small and medium-size companies wanting the BBS dial-in functionality along with extended client features for an Internet or intranet solution.



Because it carries over its BBS functions, Wildcat! includes a dozen different manage-

EASY TO SET UP: The configuration information is easily accessed through Mustang's straightforward menus.

ment and telecommunications applications. We found it difficult to understand which were required to configure the server. As a result, we were forced to consult the documentation (this wasn't the case with the other servers we reviewed). But if you're already familiar

with BBS software, you should have little trouble.

Mustang's optional Internet Connectivity Package adds HTML functionality to Wildcat! and lets users access many of its features with a standard Web browser.

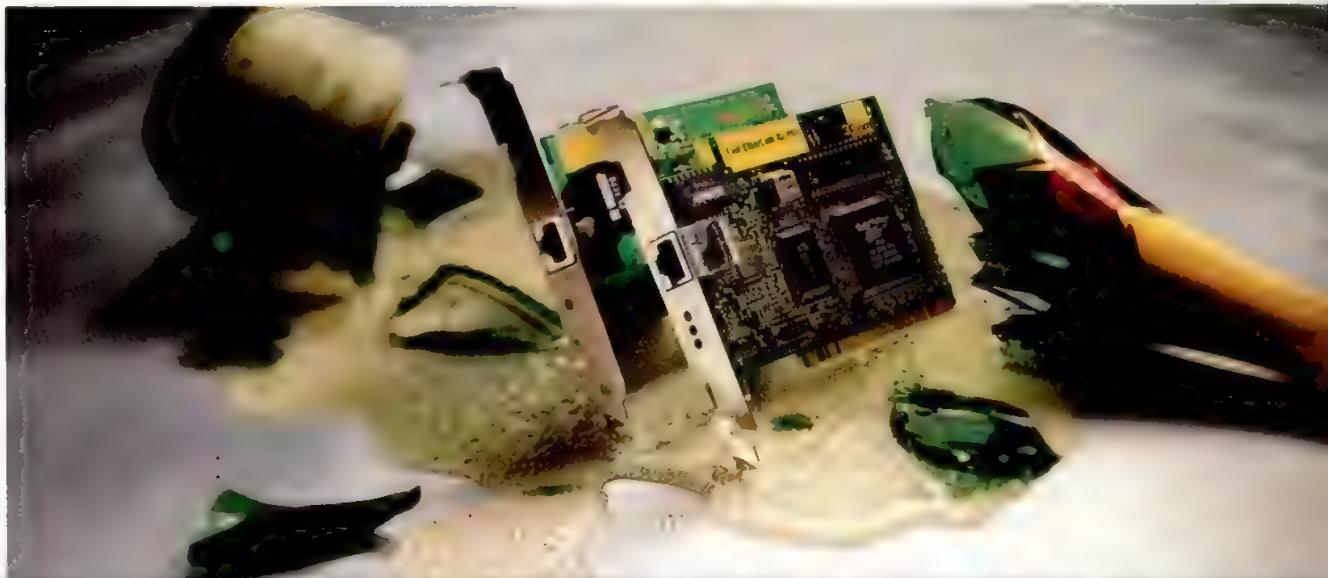
Wildcat! also has a set of client tools called Wildcat! Navigator. These provide messaging, chat, teleconferencing, and file-transfer functions. Because Navigator is a proprietary client, creating attractive pages and flexible applications is easier with Navigator than with HTML.

Though you can use any Web browser with Wildcat!, access to the information on the server is limited unless you use Navigator. Most of the advanced features and graphics are only available with Navigator. Mustang is expanding the system's

capabilities by offering a browser-independent solution using Dynamic HTML technology, which should be available by the time you read this.

Thanks to the BBS dial-in capabilities of Wildcat!, you can quickly provide dial-up access, allowing the BBS server to act as a small Internet access point.

For those who want to create new Internet or intranet sites, or who want interactive functionality without writing custom Java applications, Wildcat! is an excellent solution. You can embed chat functionality within a Web document, which will allow you to jump quickly to a chat session while continuing to browse the site. Currently, such solutions require complex custom Web applications, but thanks to the combination of Wildcat! 5 and Navigator,



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NETWORK EDITION

First Looks

CROSSTALK



Frank Derfler

“Welcome to the pages of the Network Edition, Leon! You're just in time to help me remind our readers of the 10-user limitation on the Windows NT Workstation license. These are dandy products for intranet service, but don't be tempted to stretch the Microsoft license beyond 10 simultaneous connections.”

“Good point, Frank. On the positive side, I think we should stress that the Wildcat! Navigator client program doesn't need IP to talk to its server. You can have Web-like services without the trouble and concern of installing IP. It also works very well over dial-up links.”



Leon Erlanger

many of these functions are built right into the system.

Wildcat! 5.0. List price: 2 users, \$149; 16 users, \$349; 32 users, \$699; Internet connectivity

pack, \$249. Mustang Software Inc., Bakersfield, CA; 800-999-9619; fax, 805-873-2599; www.mustang.com. Circle 951 on reader service card.

ISDN ROUTERS

ISDNet Packs More in the Box

By Les Freed

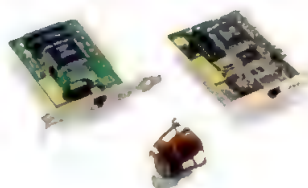
Just as we've come to expect from the new breed of ISDN routers, the NetRouter 1080 from ISDNet has combined a single-line ISDN multiprotocol bridge/router and an eight-port Ethernet hub into one compact box. At \$1,895, the NetRouter costs considerably more than other small ISDN routers we've seen, but it has several security and line charge-saving features that may make it worth the money in the long run.

The NetRouter provides IP and IPX routing and IPX bridging on a single ISDN line. Each ISDN B-channel can operate

independently, allowing the NetRouter to place calls to two separate routers simultaneously. The NetRouter can also answer incoming calls from other routers or PPP-compatible ISDN terminal adapters, which allows it to be used as a small remote-access router.

A laptop-size box, the NetRouter has an array of LEDs and a small LCD on the front, and a row of connectors on the back. The front panel has 13 LEDs: Eight of them show the status of each of the Ethernet ports; additional LEDs monitor power, LAN traffic, and ISDN traffic, as well as errors. A small LCD shows

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First Looks

the status of both ISDN B-channels, and a push button next to the LCD lets you switch the LCD to show connect times for each of the two B-channels.

The rear panel has eight 10Base-T Ethernet ports, an ISDN S/T connector, an RS-232C administration port, a reset button, and an AC power connector. Most small ISDN routers now come with a U interface as standard equipment; the U interface provides a direct connection to the ISDN line. The NetRouter uses an S/T interface, but ISDNNet provides a two-port NT-1 interface to connect the NetRouter to the ISDN line.

This approach allows you to connect an additional device, such as an ISDN telephone, to the same line as the router. The NetRouter does not provide POTS voice phone support, so you'll have to buy an expensive ISDN phone if you want to use the line for voice applications.

Connecting the NetRouter is simple. Like most small routers, you just plug in the cables and turn it on. The use of an external NT-1 interface complicates matters slightly, since you have

to provide AC power for the NT-1's external power transformer. The NetRouter itself has a built-in power supply with no external transformer, and it includes a power on/off switch, a feature missing from many small routers. The power switch is a simple and effective after-hours security device.

The NetRouter's weakest point is its built-in configuration software. To initialize the NetRouter, you must connect a terminal or a PC with a terminal emulator program to the NetRouter's serial port. The NetRouter manual explains this process in detail and even includes point-by-point instructions on using the Windows 3.x Terminal program to initialize the NetRouter. Once you've connected the terminal and assigned the NetRouter an IP address, you can connect to the NetRouter over your LAN via telnet.

Whether via telnet or the RS-232 port, you'll use the same choose-by-the-numbers configuration menu to configure the NetRouter. The menu system is fairly straightforward, but there's no help system. Some menu items aren't clearly

explained in the menu system, though they are explained in the manual.

Once you get past the 1970s-style menu system, there are plenty of options to configure. The NetRouter can place calls to two separate host routers at once, one on each ISDN B-channel. This allows you to connect to two WANs at the same time. We were able to connect to a local ISP for Internet access while connecting to our test-bed router for IPX traffic. The NetRouter can also answer incoming calls from any PPP-compatible ISDN TA or router, which allows it to operate as a small remote-access router.

The NetRouter has an outstanding set of security and ISDN line management tools. In addition to the usual CHAP and PAP security, the NetRouter provides packet filtering, which allows you to control the type of traffic passed through the router. You can filter packets based on protocol type, or by source or destination address. You can control your ISDN line-usage charges by limiting outbound calls to a predetermined per-call time limit or to a monthly aggregate

time limit. You can also set the NetRouter to operate only during certain hours of the day, preventing after-hours usage of the ISDN lines.

The NetRouter supports dial-on-demand and bandwidth-on-demand. This allows the router to place calls to a host router automatically on an as-needed basis and then bring the line down when no traffic has moved for a certain period of time. If the volume of traffic exceeds a predetermined limit, a second call will be placed to the host router to add additional bandwidth.

We tested the NetRouter by calling several other routers with one and two B-channels enabled. Thanks to Stac data compression, the NetRouter performed very well, providing over 250 Kbps in our informal testing.

Our lone gripe, aside from its price, is the NetRouter's lack of a GUI management program. ISDNNet is working on a Windows-based management program for the NetRouter, and the NetRouter does support SNMP management software. **NetRouter 1080.** List price: \$1,895. ISDNNet Inc., Sunnyvale, CA; 408-522-5090; fax, 408-720-9114. Circle 953 on reader service card.

RAID SUBSYSTEMS

LightningArray Strikes

By Steve Rigney

Several RAID subsystem storage solutions on the market can hold gigabytes of data, provide quick response times, and protect your files in the event of a hard disk crash. But you'll find few as powerful—or as expensive—as Aiwa's LightningArray RAID subsystem.

The LightningArray can hold between 2GB and 45GB of data, offers RAID Level 3 and Level 5 protection, and includes redundant power supplies and extremely useful and powerful management software. You will, however, have to pay for this functionality. The LightningArray we tested,

which had six 4GB drives, retails for \$22,767.

Any host SCSI-based operating system, including SCSI-1, SCSI-2, and SCSI-3 will work with the LightningArray. This allows you to install the subsystem easily on any PC with a SCSI adapter. On our tests, we attached the subsystem to a Compaq ProSignia 500 and installed Windows NT 3.51 on the 20GB partition.

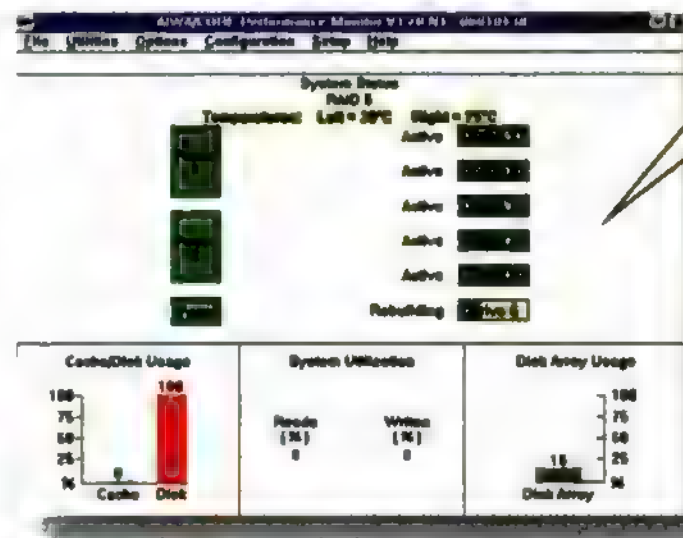
You don't have to use special drivers or installation methods with the LightningArray; the OS will automatically see the subsystem as one large drive. You can attach the system to any PC running NetWare, Windows NT, IBM OS/2, or Unix.

And with Windows NT, we had the system installed and were able to begin accessing the subsystem in less than 15 minutes.

All the RAID hardware and software—including a 40-MHz LR33310 RISC processor and 8

160 Mbps across the subsystem's 64-bit bus. The caching, combined with the high-speed bus, provides sustained access speeds of 20 Mbps between the server and the subsystem.

The chassis also includes two



MONITOR MORE:
The Performance Monitor even gives you the temperature in the unit.

MB of ECC (error correction code) RAM expandable to 128MB for disk caching—comes in the LightningArray chassis. The cache operates at

redundant power supplies and six hot-swappable drive bays. Though a single power supply keeps the unit up and running, the power supplies aren't hot-swappable, so you have to power down the system to replace a faulty power

Okay, so
you're a Token Ring kinda person. In fact you
love it. Gotta admit, the network's always been there when
you need it, never let you down big-time. But we know you need
more bandwidth. And not sacrificing memory for high performance,
or vice versa, is real important. Hey, we can fix that. After all,
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Token Ring

has given you lots so far. Now it can give you
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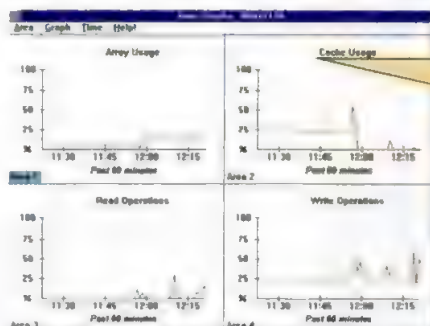
First Looks

supply. The disk drives are hot-swappable, however, and you can replace and add a drive without turning off the subsystem.

On our test, we removed a single drive during a large file transfer. The Lightning Array immediately notified us of the failed drive, but the data transfer was not affected. As soon as we reinstalled the drive, the software automatically started a rebuild on the new drive. It took almost half an hour, however, to rebuild the drive after we reconnected it. Luckily, each drive has a lock and key, so you don't have to worry about someone accidentally removing an active drive.

Another nice feature of the LightningArray is the dual SCSI bus in the system. You can attach two separate PCs to the same subsystem and install

different operating systems. This is a great way to provide lots of storage space using a single RAID system. You could also attach both SCSI buses to two separate con-



GOOD TIME:

You can see how your subsystems are functioning at different times.

trollers in the same server to provide full disk duplexing and mirroring. It is extremely easy to change the settings of the drives and controllers using the built-in management software.

While the hardware is definitely an important part of the LightningArray, the product also includes powerful management and monitoring software. The LightningArray Perform-

ance Monitor for PCs running DOS, Windows 3.x, Windows NT, and OS/2 provides

you with a graphical view of all your disk drives and their status. The interface even includes the temperature of each side of the chassis.

In addition to monitoring

the subsystem, Performance Monitor also lets you rebuild a drive, set up caching, monitor disk access, and configure notification options. You also can use the Performance Monitor to connect, manage, and control your subsystems either across the LAN using the SCSI cable or remotely using a serial cable, modem, and the RS232 port on the unit.

An expensive RAID subsystem isn't for everyone, and it's probably overkill for some small LANs. But if you need to save large amounts of data and have quick access to your information, the LightningArray is a good bet.

LightningArray. List price: As tested, \$22,767. Aiwa America Inc., Boca Raton, FL; 407-997-6044; fax, 407-997-6009. Circle 955 on reader service card.

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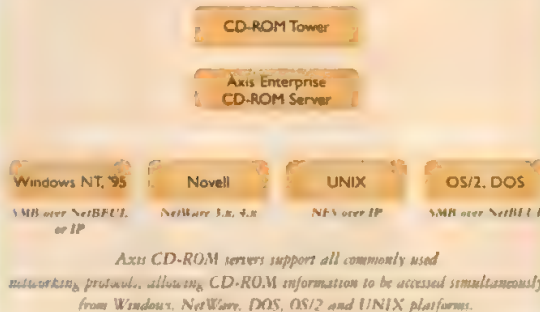
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Management is easier, too. Using your existing file management tools, you can install or move an Axis CD-ROM server without shutting down your main file server; and once the discs are loaded, no additional administration

is necessary. You can even control user access to license-restricted discs.

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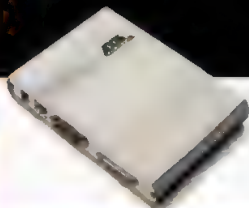
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aspects of CD-ROM sharing, and to improve your peripheral vision in general. Just log onto our web page at <http://www.axisinc.com> and check out our complete line of network peripheral products, as well as our free guide *How to Share CD-ROM Resources on Networks*.

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Medalist Pro 2520	2.5 GB	11.0 msec	5,400 RPM	116 Mb/s	16.6 MB/s

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NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Michelle Schoenung

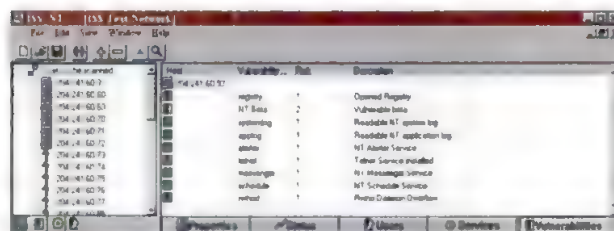
ISS's Tiger Team in a Box

IF YOU DON'T HAVE THE resources—or the inclination—to hire a crack team of hackers to probe the weaknesses of your network, you may want to consider Internet Security System's **SAFesuite** (\$4,995 for a perpetual license for a Class C network).

SAFesuite for Unix or Windows NT includes Web Security Scanner 4.0, Firewall Scanner 4.0 and Intranet Scanner 4.0 (previous versions of Intranet Scanner

were called Internet Scanner).

The SAFesuite utilities sniff out security vulnerabilities and generate HTML-



SCANNERS: SAFesuite's comprehensive utilities probe your network to discover possible security weaknesses.

based reports with links to CERT advisories and various patch sites on the Internet. **Internet Security Systems**, Atlanta, GA; 404-252-7270; www.iss.net. **Circle 957 on reader service card.**

Virtual Intranet

INFOEXPRESS'S **VIRTUAL TCP Online** makes it possible to access a corporate intranet through popular online services and Internet service providers.

This middleware application turns online services into virtual private networks. Virtual TCP Online creates an encrypted tunnel between the remote PC and the corporate intranet. Remote users can check e-mail and Web pages, or run Windows TCP/IP applications.

The product consists of a Windows client and a proxy server, which run on the corporate network.

The server software (\$1,495) is available for most versions of Unix and will soon ship for Microsoft Windows 3.x, Windows 95, and Windows NT. The client software (\$89 per client) is available for Windows 3.x and Windows 95.

Because some online services support only 16-bit applications, Virtual TCP Online adds 32-bit support to the online software. This enables Windows 95 users to run 32-bit applications when accessing remote networks.

Virtual TCP Online is compatible with America Online, CompuServe, Netcom NetCruiser, Microsoft Windows 95, TCP/IP, Trumpet Winsock, and various other services.

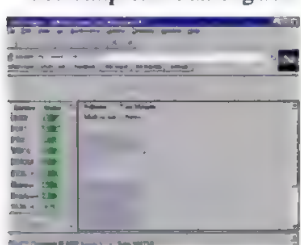
InfoExpress, Los Altos, CA; 415-969-9609; www.infoexpress.com. **Circle 958 on reader service card.**

Ipswitch's Self-Monitoring E-Mail Server

FOR NETWORK ADMINISTRATORS who want to keep their fingers on the pulse of their e-mail systems, Ipswitch offers a new version of **IMail for Windows NT** (\$495 base price; \$195 to upgrade).

Most impressive among a list

of new features is IMail Server 3.0's self-monitoring capability. In the event of a problem, IMail automatically notifies network administrators via desktop alarm or pager.



MANAGE ANYWHERE: Network stats via the World Wide Web.

of new features is IMail Server 3.0's self-monitoring capability. In the event of a problem, IMail automatically notifies network administrators via desktop alarm or pager.

This Internet mail server also monitors other services running on the Windows NT server and can be managed from the Web. IMail Server for Windows

NT now provides multidomain support for mail by implementing multiple virtual hosts on one Windows NT system. ISPs can use this feature to assign a different virtual host to send and

receive mail from each customer's unique domain. **Ipswitch Inc.**, Lexington, MA; 617-676-5700; www.ipswitch.com. **Circle 956 on reader service card.**

HOT PROSPECT

Gigabit Ethernet on the Way

Just when you were getting used to the idea of Fast Ethernet, Alteon Networks, a company formerly in the high-performance parallel interface (HIPPI) market, has announced that it will ship a **Gigabit Ethernet NIC, device driver, and switch** this December.

Although the IEEE will not have finalized the Gigabit Ethernet standard by the time Alteon's products hit the market, the company says its new line will be flexible enough to conform to any possible changes.

Alteon's 1,000-megabits-per-second (1,000-Mbps) PCI adapter will be the first of the three products to ship. It will have a 32-bit RISC processor and separate read and write DMA channels. The company is now readying Unix drivers for the NIC, NDIS and ODI drivers will come later.

Alteon's products will be compatible with Ethernet and Fast Ethernet. Pricing is not yet available, but expect products to cost about 2.5 times more than their Fast Ethernet counterparts.

Alteon Networks, San Jose, CA; 408-574-5500; fax, 408-574-5501. **Circle 954 on reader service card.**



Bridging Wireless LAN Interoperability

IN AN EFFORT TO migrate its WaveLAN wireless networks seamlessly to the IEEE 802.11 standard, Lucent Technologies has introduced its wireless bridge, **WavePoint II**.

A compact 7 by 10 inches, the WavePoint II uses dual PCMCIA-based, RF network interface modules to connect Ethernet LANs to WaveLANs.

The 802.11 standard, which will promote interoperability among wireless LAN products from different vendors, is expected to be finalized in some time next year.

Lucent says that the bridge's modular network



WAVEPOINT II connects to Lucent Technologies' WaveLAN.

makes it flexible for possible IEEE 802.11 compliance upgrades.

Lucent Technologies, Warren, NJ; 800-357-3249; www.lucent.com. Circle 959 on reader service card.

Remote Access for Dummies

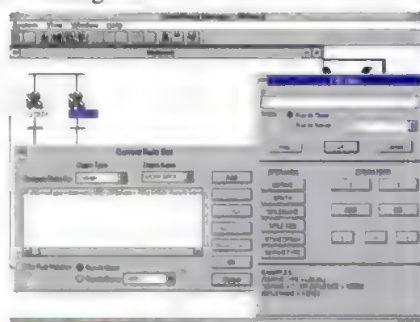
CUBIX'S **APPLINK** (\$2,995) FOR Citrix's WinFrame Application Server is the latest addition to its expanding WorldDesk remote-access/clustering product line.

This rules-based software application can automatically select remote node or remote control for a user who is dialing in to the WinFrame. This takes the decision out of the hands of the remote user and optimizes the connection.

Also, Applink helps balance the loads of the WinFrame servers to enable PCs to perform as clustered processors.

The WorldDesk family also includes Commuter, a remote-node dial-up server, and Comlink, Microsoft Windows NT-based remote-node server software.

Cubix Corp., Carson City, NV; 800-829-0550; www.cubix.com. Circle 960 on reader service card.



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MULTIPLE ACCESS By Frank Derfler

3,000 ISPs Can't Be Wrong



Did you know that there are over 3,000 Internet service providers doing business in North America? The number of ISPs is going up, not down. While we tend to think in terms of AT&T, PSI, UUNET, and their big competi-

tors, you have many small and eager connection providers in your backyard. You can work with these companies to get custom services that you can have installed before the bigger companies can even give you a price quote.

Interestingly, these ISPs are on the verge of something very big: dial tone. The 1996 Telecommunications Reform Act was a set of rough plans created by Congress. It's up to the FCC to build a framework from the plans, and then the competing companies will create the structure on that framework. In early August, the FCC set up a framework that makes it pretty easy for anyone to get into the dial-tone business. Would-be dial-tone vendors can start buzzing by installing their own facilities, buying facilities from existing companies, or reselling service. Think about it for a minute: Practically anyone with good-size PBX could resell you a dozen lines by dropping a T-1 and a mux into

your office. Now, combine the dial tone with Internet access (no big deal) and private virtual network digital service (a very big deal) and you have thousands of mini-AT&Ts and MCIs springing up around the country.

Caveat emptor in a big way. But think of the opportunity and the flexibility. If your company has a big pool of leased lines and a PBX that is lightly loaded half the day, you can create a business plan to resell that capacity locally. Are you in the IS department of a large hospital or university? How about reselling some dial-tone and digital-access capacity to the surrounding community? Yup, it's legal, and you already have the backbone connections, technical support, accounting, and other structures in place. Okay, the big challenge is getting the service the last mile into houses and businesses. But think about deals with cable companies, or think wireless links.

If you're in a start-up business or in a business such as publishing that hates owning assets, why not let somebody else worry about long-term investment in packages of circuits, routers, and trained people? Let these small ISPs create your intranet. Let them provide local

digital connections in the form of virtual private networks that your employees can use to get into the corporate LAN without opening the LAN up to intrusion from predators on the Internet backbone.

There are a self-extracting WordPerfect file, a news release, and more stuff on www.fcc.gov/. Check it out and get inspired!



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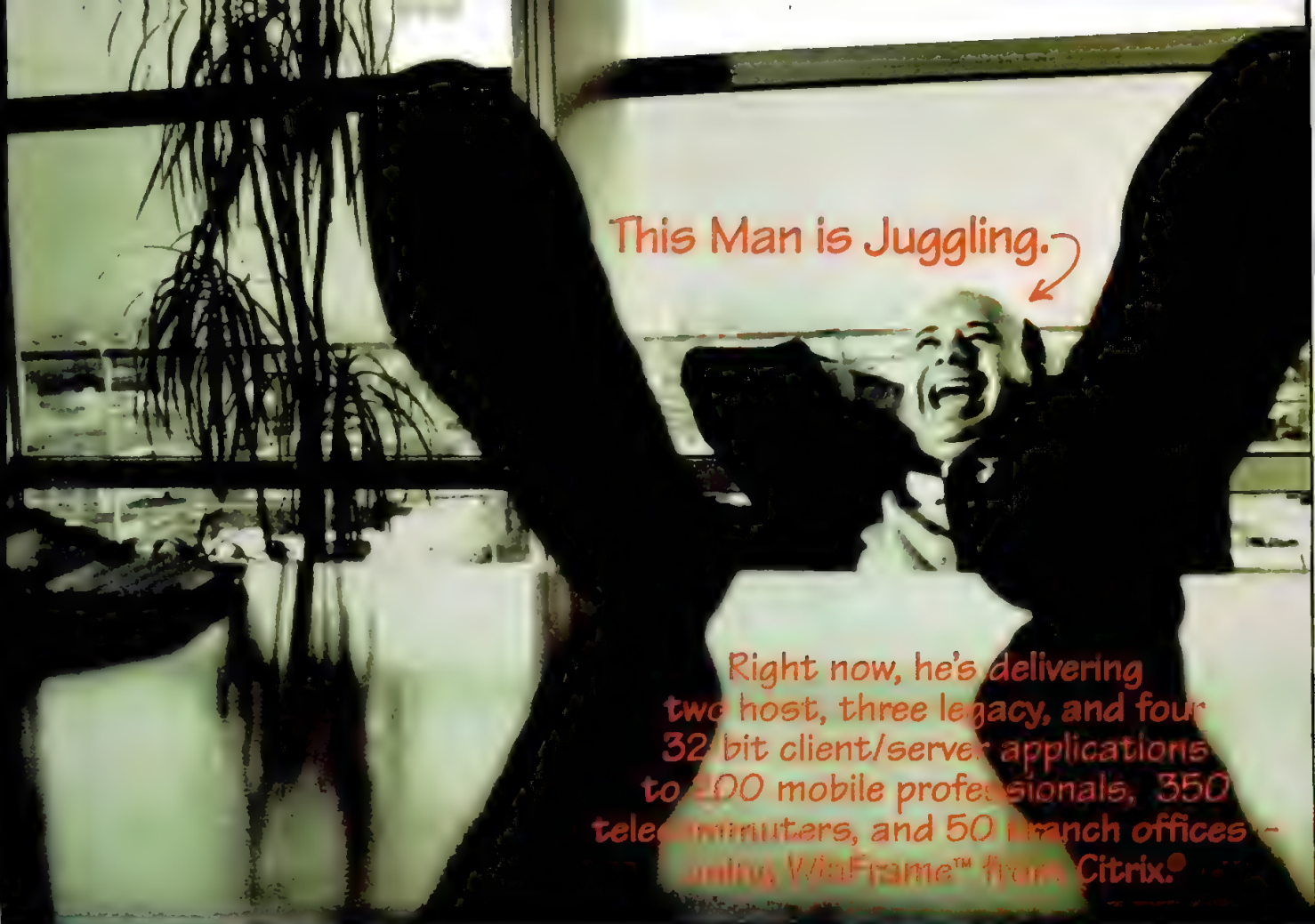
U.S. Robotics Gardet V Everything (33.6k-bps connection)	Average throughput
AT&T Comphere BE2410S (33.6k-bps connection)	63.4
Hayes OPTIMA 288 VLSI* (28.8k-bps connection)	63.7
	79.4



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- **Leverage Your I/T Investment.** WinFrame works with your existing remote access infrastructure, reduces network traffic, and extends the life of your existing desktop hardware. In fact, WinFrame clients can range from legacy PCs to Pentiums, from Macs to UNIX workstations.

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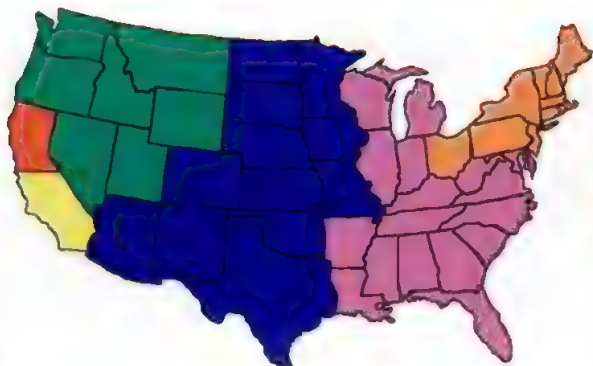
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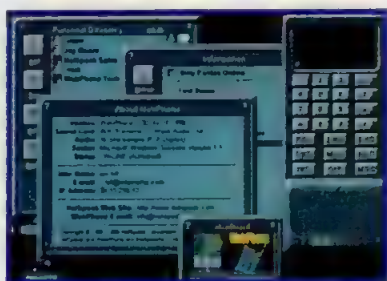
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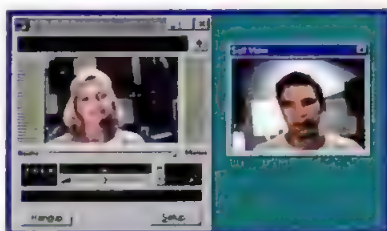
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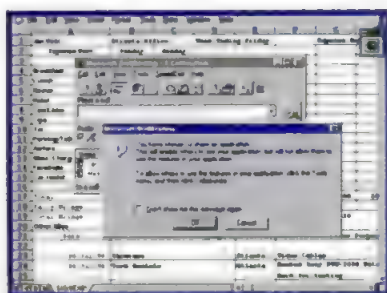
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INTERNET TELEPHONES send your voice over the Net, avoiding the public switched network and long-distance charges. The best are easy to use, work with standard sound hardware, and have extra features, from voice mail to voice distortions. Many are free. We tested nine products over a variety of connection speeds. **See page 107.**



INTERNET VIDEOCONFERENCING allows you to look your colleagues in the eye or reach out visually to a wider world. We tested four solutions that work with standard videocams, don't require capture cards, and deliver results over far slower connections than you might think possible. **See page 137.**



INTERNET COLLABORATIVE TOOLS allow you to share applications, develop ideas, talk, exchange messages, or simply transfer files to one or more colleagues. The four products that we tested even work over modems, permitting collaboration with far-flung conferees. **See page 149.**

Colab on the WEB

DON'T JUST BROWSE THE INTERNET. USE IT TO CONNECT. FROM BASIC E-MAIL TO CUTTING-EDGE VIDEOCONFERENCING, THE INTERNET MAKES IT MUCH EASIER TO SHARE IDEAS AND KEEP IN SYNC WITH COLLEAGUES, BUSINESS CONTACTS, OR EVEN STRANGERS WHO SHARE YOUR INTERESTS.

IN THE PAGES THAT FOLLOW, WE REVIEW 41 PRODUCTS IN 6 CATEGORIES WHERE THE INTERNET IS REDEFINING COLLABORATION. OUR SURVEY RANGES FROM LONG-ESTABLISHED CATEGORIES SUCH AS NEWSGROUP READERS TO BRAND-NEW GENRES SUCH AS INTERNET PHONES. THREE AREAS—INTERNET



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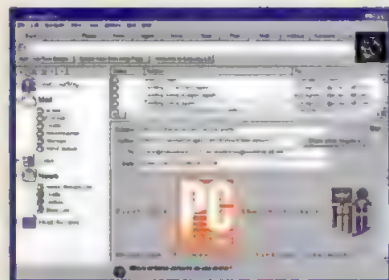
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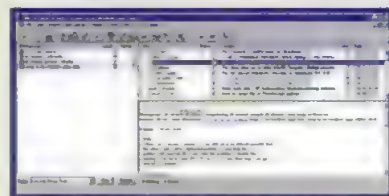
BROWSING THE WEB IS AMAZING ENOUGH. BUT WHEN CY-
BERSPACE LETS YOU SEE AND TALK TO PEOPLE, SHARE APPLI-
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NEWS READERS provide you with access to Usenet newsgroups and the gigabytes of threaded discussion data they contain. To locate and monitor the threads you want in a haystack that big, you must have a powerful tool at your disposal. We take a look at nine news readers to help you manage this rich but chaotic resource. **See page 163.**



E-MAIL is still the Internet's number-one application, letting you exchange messages with almost every Net-connected person in the world. We look at 12 solutions, many of which are free, to help you join this growing community. Our tests found that a strong mail client provides much more than just an in-box. **See page 183.**



GROUPWARE has felt the long arm of the Internet, which has changed the way groups exchange information. We look at Lotus Notes and Microsoft Exchange, which are extending their messaging platforms to the Web, and compare them with Netscape's Internet-based SuiteSpot, part of the new breed of intranet products. **See page 209.**

REAL-TIME COMMUNICATION: CONNECTING ON THE NET

Internet telephony demands a reasonably fast PC with a sound card (1), a microphone (2), speakers (3), and an Internet connection (4). **Videoconferencing** requires at least a standard video camera (5); a video capture card (6) can provide better performance. Modems are fast enough to use with Internet phones, but you'll need ISDN connections or better for good video performance.



Internet-enabled telephony, videoconferencing, and collaboration are here. They'll become standard tools before you know it.

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By Jon Hill, Jan Ozer, and Thomas Mace

everyone involved.



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Join Us Online from September 20 to October 4 to discuss the products in this story. Also visit www.internetuser.com for other useful links.

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Sound farfetched? It's a standard scenario, something you can do today at minimal hardware and software cost.

Internet telephones let you talk across the Internet to any PC equipped to receive your call. For U.S. businesses, they're an interesting alternative to standard telephones. For international telecommunications, they can offer enormous savings. They are also undeniably fun, and the new Internet phone communities they've created resemble the rough-and-tumble world of Usenet newsgroups.

Internet videoconferencing offers a very low-cost alternative to traditional proprietary systems. It demands higher bandwidths than Internet telephony (at least ISDN speeds, for now), so its broadest appeal will be to business users. But the right package, properly set up, can deliver impressive results.

Internet collaboration products deliver a host of interactive technologies that excel at bringing impromptu workgroups closer together. Multiple users can work together in an application, sketch out ideas, chat, and pass files back and forth.

All of these technologies have antecedents in network-based systems. But as they've moved to the Internet, they've gained enormous geographical reach while their costs have fallen to little or nothing.

INTERNET TELEPHONES

Whoever said that talk is cheap was right. Internet telephones let you talk to people all over the world, just for the price of your Internet connection. Many of the phone packages themselves are free. We reviewed nine products from this burgeoning category. All work with standard PC sound hardware and Internet connections (whether via network or via modem), and all support both full-duplex (simultaneous two-way) and half-duplex (alternating send/receive) transmission.

Internet phones are essentially for point-to-point communications. (The one exception, NetSpeak's WebPhone, lets you conference multiple calls.) You can establish a direct connection if you

Internet telephones:

WebPhone 2.0

Internet videoconferencing:

VDOPhone Internet

Internet collaborative tools:

Microsoft NetMeeting

Every new market needs its defining products. All our Editors' Choice winners pull off the rare feat of establishing high standards of quality in emerging categories. A real standout among the Internet telephones we tested, NetSpeak's WebPhone 2.0 offered the most compelling blend of high-quality audio and a host of features aimed at serious business use. WebPhone is the only product we saw that lets you conference multiple callers, transfer calls, leave outgoing messages, and let selected users punch through your Do Not Disturb sign. Its higher-bandwidth codec delivered flawless full-duplex performance and also adapted successfully to lower-speed connections.

Intel's simple Internet Phone merits an honorable mention for championing the ITU H.323 standard for low-bandwidth audio and videocon-

ferencing, as well as for its compatibility with third-party Internet "White Pages" providers. Standards and directory services will be central to the next generation of Internet telephony.

Internet videoconferencing poses much greater technical challenges than telephony and collaboration, especially over low-bandwidth connections. VDOnet's VDOPhone handles these challenges impressively through an advanced scalable codec that adapts the transmission to available bandwidths. The product's clear interface and its use of a single video codec also make it very straightforward to set up and use. If used with a standard color videocam, VDOPhone requires a more powerful PC than other systems we tested. But whether used with a capture card and an NTSC camera or just a basic grayscale videocam, it delivers an impressive solution.

In the new Internet collaboration market, Microsoft NetMeeting is a true groundbreaker. It was the only product we saw that had all five major collaboration functions: audio, whiteboard, application sharing, text chat, and file transfer. It was also among the most intuitive and easy to use. NetMeeting is the first collaboration product to support the T.120 conferencing standard, the status of which Microsoft's influence will substantially boost.

users of the same Internet phone software as yours. Thanks to the ITU H.323 standard for low-bandwidth audio and video conferencing, interoperability between vendors is imminent. Intel's Internet Phone is the only reviewed product that supports H.323, but IBM, Microsoft, and others have announced that they will add support soon.

The heart of any Internet phone product is its coder-decoder, or codec, the software that compresses the digi-



Our Contributors: JAN OZER is President of Doceo Publishing, a developer of digital-video Internet-related testing tools in Norcross, Georgia. He is also the author of *Video Compression for Multimedia* and a frequent contributor to *PC Magazine*. JON HILL is a frequent contributor to *PC Magazine* and runs jah consulting in New York City. THOMAS MACE was the senior editor in charge of this story, and JAY MUNRO was the project leader.

tized voice data and decompresses it at the other end. We saw lots of variation in the number and quality of the codecs supplied with each product. Many products included an entire suite of codecs designed to handle modem connection speeds between 2,400 bps and 28.8 Kbps. We also found that the quality of transmitted sound was closely tied to the codec. Among the best were Codec 723, used in Intel Internet Phone; the Lernout & Hauspie codecs used in Microsoft NetMeeting; and the DSP Group's TrueSpeech codec, used in Internet Phone, WebTalk, and WebPhone. All of these codecs require a relatively fast modem connection. If yours is very slow, the ultrahigh-compression RT24 codec used in TeleVox and others may be your only option. Overall, we found that the high-compression codecs needed for slower connections were the ones most likely to suffer from severe delays, annoying distortion, or total breakup of the data stream.

PART BUSINESS, PART FUN

Most Internet phones offer more than just telephony. Business users will be most interested in voice mail, answering machines, and similar features. Among the several products with such utilities, WebPhone stands out with its support for multiple phone "lines," multiparty teleconferencing, e-mail voice messaging, outgoing messages for individual callers, flexible call blocking, and answering machine functionality.

Business aside, Internet phones can be lots of fun to play with. There's nothing like reaching out and touching someone—especially when it's free. To encourage happy chatting, most of the phone vendors divide their server-based user listings into interest groups, along the online-service model. These ranged from programming enthusiasts, to ham radio operators, to the inevitable sex groups.

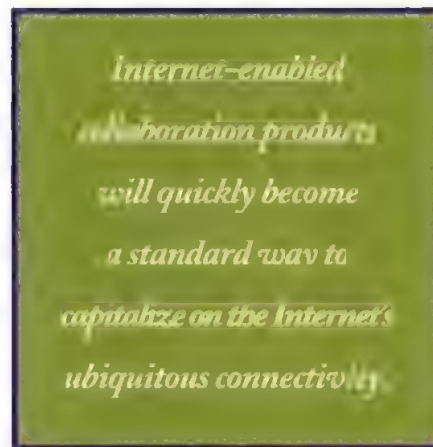
INTERNET VIDEOCONFERENCING

If you've attended a videoconference, you know that it can go a long way toward bridging distance and building relationships. Internet videoconferencing offers a new and inexpensive solution. We reviewed four packages either currently shipping or in public beta, all positioned

as Internet-centered solutions and all able to work with standard videocams and sound cards.

Like Internet phones, Internet videoconferencing is largely point-to-point. Only one reviewed package, Enhanced CU-SeeMe, supports true multiconferencing, in which a group of people can see all the participants at once. Connectix VideoPhone provides point-to-multipoint transmissions, in which several stations can view the output from one.

If bandwidth constraints are problematic for Internet phones, they're potentially crippling for videoconferencing. Video data is much denser than audio, and transmitting both sound and video re-



quires bandwidth for two codecs' output. In general, we achieved very good results over a T1 connection: up to 10 video frames per second (fps) of 160-by-120 pixel video and clear audio. At ISDN speeds, the packages were also quite usable, typically delivering 4 to 7 fps. When we dropped to modem speeds, quality, speed, or both tended to go through the floor. Only CineVideo/Direct delivered 2 fps, and that was without audio.

If you have a higher-bandwidth Internet connection, Internet videoconferencing is well worth investigating. At modem speeds, the technology has gee-whiz appeal but little else.

INTERNET COLLABORATION

Internet-enabled collaboration products will quickly become a standard way to capitalize on the Internet's ubiquitous connectivity. With roots in the networked document conferencing and Internet telephone markets, this new category offers a wealth of diverse features, including ap-

plication sharing, shared whiteboards, chat, file transfer, and audio conferencing. We reviewed four currently shipping products that offer either application sharing, audio conferencing, or both, as well as shared whiteboard and chat.

Application sharing lets multiple parties view and edit a file in its original application, using that application's tools. We found it a potent tool that generally works well.

A BETTER WHITEBOARD

The center of any old-fashioned, face-to-face meeting is the whiteboard, where conferees use multicolored markers for outlining. The whiteboard applets of Internet conferencing programs let remote conferees work much the same way.

Basic whiteboard applets provide freehand drawing tools around a canvas. Participants' annotations appear on all conferees' screens, generally almost in real time. Most whiteboards can also paste files copied from other programs, such as word processors and spreadsheets, providing a useful review function. And you can usually print and save the whiteboard file. Most programs keep pasted data separate from annotations, so you can mark up a pasted memorandum and then clear your scribbles without losing the memo.

Advanced whiteboard features include screen capture capabilities; a remote pointer that you can use to highlight without actually marking; screen synchronization, which lets everyone look at the same location; and image compression, which speeds data transfer between participants.

The three other main features in collaboration programs—chat, file transfer, and Internet telephony—are useful extras. Chat, somewhat of a misnomer, is the exchange of typed messages in a dedicated window. File transfer capabilities make it as easy to send a file to 16 participants as to 1 person. Only two of the packages, CoolTalk and NetMeeting, include Internet phone capability.

The following 17 reviews of Internet phones, Internet videoconferencing products, and Internet collaboration tools provide more details on their capabilities and will help you pick the ones best for your needs.

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- CD Software Bonus Pak (Infopedia 2.0, Compton's New Media ZOO EXPLORER, The American Heritage TALKING DICTIONARY, and BodyWorks 4.0)
- Microphone w/stand
- 80W PMPO Amplified Stereo Speakers
- ProGen ProCare Warranty (3-yr + 1-yr on-site)



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CIRCLE 287 ON READER SERVICE CARD



Whoever said that talk is cheap was right. Internet telephones let you talk to people all over the world—just for the price of your Internet connection. Many of the phone packages themselves are free.

Netscape Communications Corp.

CoolTalk

With its answering machine, photo ID, and slick, easy-to-use interface, Netscape's CoolTalk has some good things going for it. Consumers should find its price compelling—it's free with Netscape Navigator 3.0—and may appreciate the chance to meet the thousands who have thronged its server-based IS-411 directory. Sadly, these features are marred by its middling audio quality and inability to maintain consistent, full-duplex throughput, two reasons for business users to look elsewhere.

CoolTalk is a two party, point-to-point

audio system with whiteboard and chat capabilities. Netscape has not announced support for the T.120 conferencing standard, leaving its future interoperability with other vendors' products in question.

CoolTalk uses a wealth of quality-enhancement technology, from a sophisticated tuning wizard that tests codec compatibility, speakers, and microphone levels; to a silence sensor that filters out ambient noise. But in testing, these controls did not lead to consistent performance.

CoolTalk uses two codecs, a low-bandwidth speech-only codec (RT24) and a higher-bandwidth general-purpose codec (GSM). Codecs are assigned according to bandwidth parameters you enter at instal-

lation and the remote user's bandwidth capabilities, but the selection can be overriden. During full-duplex testing, both codecs suffered frequent short audio gaps and several longer breaks. GSM was the worst, and it was difficult to read even a short sentence without one or two breaks.

Both codecs produced average-quality audio. The RT24 codec was noticeably fuzzy; the higher-bandwidth GSM was somewhat better, but its results were marred by the frequent dropouts. In general, performance was better in half-duplex tests, where careful diction and slow pacing produced acceptable results.

During installation, you complete a Business Card with name and other information and a thumbnail image of yourself. This data gets exchanged during the initial handshake so you immediately see a picture of your caller before you answer.

The answering machine, when enabled, picks up calls after a few seconds and plays the prerecorded greeting. Messages can be of any length, and a button tells you how many messages are waiting when you return. Click on a message and the caller's picture ID displays along with other Business Card information. During our tests, recorded message quality was consistently high, exhibiting few of the flaws of real time conversation. Of course, your Internet connection must be active to use the recorder, which essentially eliminates most users with dial-up connections. But for business users accessing the Inter-

INTERNET TELEPHONES

How to Read the Suitability to Task Boxes

Business use We looked for good-quality audio that has minimal delay times and mimics the normal telephone experience. Business-specific features such as voice mail, answering-machine capability, call transfer, multiple-caller handling, flexible call refusal, and the ability to block specific callers increased the rating. We gave extra points to products that supported emerging interoperability standards such as T.120 and H.323. The phone should also allow the user to specify a proxy server behind a corporate firewall. The inclusion of whiteboard modules, text-based chat, or file transfer was a plus. Overall, we looked for automated setup, a clean interface, and clear controls. Products that force the user to pick codecs manually or make arcane adjustments fared less well.

SUITABILITY TO TASK

Product name

	Power	Ease
Business use	Fair	Fair
Home use	Good	Good
Voice mail	Excellent	Excellent

Home use In addition to the basics of clear audio at a variety of bandwidths, the telephone should provide a range of options for the enjoyment of the product even if the user does not know anyone else with an Internet phone. The company should maintain publicly accessible servers with lists of current users. Ideally, the servers should support "chat rooms," preferably divided into discussion topics, where users can initiate

and accept conversations. Users should have the facility to refuse unsolicited calls and the ability to block offensive callers. Phone services such as speed dial, call transfer, and hold improve the user experience. A directory of users is desirable, as is the ability to create a personal address book. Special effects like voice distortions improved the rating as long as they did not interfere with overall usability or sound quality.

Voice mail The Internet phone should let you leave voice mail messages for parties that are offline when you place a call. An optional voice mail module for playing messages, which does not require the full phone package, is a plus. The product should also let users record a greeting for incoming callers.

SOFTWARE TESTING

Internet Telephones



Our tests put extreme stress on Internet phones, turning up big differences.

Some packages delivered full-duplex communication gracefully, while others suffered severe delays, distortion, audio breakup, and significant dropouts.

How We Tested

We ran our tests of Internet phones across real-world Internet connections, using both 28.8-Kbps modems and a T1 link. Connections began and terminated at a common bench at PC Labs so that we could monitor both clients at once. We began by running through setup and installation and exercising all product features. Then, we moved on to formal quality tests, which we repeated at several different times of day to average out fluctuations in available Internet bandwidth and routing.

We began the quality tests of each product by attempting to

establish a full-duplex connection between two identical setups. Once we had a connection, the testers at each end read paragraphs of a prepared script, first in alternation and then simultaneously. We captured the audio input and the output at each end of the connection directly from the sound cards, which we patched to the left and right channels of a stereo tape deck. Comparing the two recorded channels gave us a good objective measure of codec quality, distortion, delay, and any dropouts.

As an informal test, we also logged onto the vendor's user-list servers if available, at various times of day, exchanging calls with other real-world users. We looked at the organization of any interest groups or "chat rooms" provided by the public server.

Our test-bed systems were Micron Millennia Plus Pentium 133 PCs with 16MB RAM, ATI Mach64 PCI video cards, Sound Blaster AWE 32 audio cards, and Andrea ANC 500 telephony headsets. To connect to the Internet, we used Practical Peripheral PM288MT II modems for 28.8-Kbps hookups, and connections to our corporate T1 line through our internal 16MB Token Ring LAN via Proteon 1392 cards for hookups at network speeds.—Jay Munro and Jon Hill

net via a LAN, the feature is ideal.

The IS-411 user directory was a minor disappointment because it displays only the name and e-mail address of the remote conferee. We also had trouble accessing it, probably due to heavy traffic.

CoolTalk showed promise, marred by sketchy audio performance and lack of support for the T.120 standard. Until Netscape addresses both issues, it's difficult to recommend CoolTalk for widespread corporate adoption.—Jan Ozer
CoolTalk. List price: Free with Netscape Navigator 3.0. Netscape Communications Corp., Mountain View, CA; 415-937-2555; fax, 415-528-4124; www.netscape.com. Circle 482 on reader service card.

IBM Corp.

IBM Internet Connection Phone

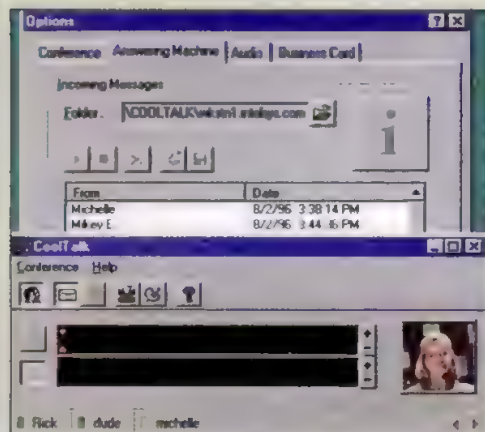
Big Blue has big plans for its IBM Internet Connection Phone (IC Phone), but the release that we tested, version 1.0, suggests that realizing these plans still has some way to go. Downloadable at no cost from IBM's Web site, Internet Connection Phone delivers good sound quality and has an easy-to-use shell. But it offers next to none of the extras we saw in other products, such as voice mail, text chat, file transfer, or a shared whiteboard, so users seeking advanced features may

want to look elsewhere.

IC Phone uses a customized GSM (Global Systems for Mobile Communications) codec that corrects for echo effects while squeezing an 8-kHz, 16-bit audio stream into 9,400 bps (compared with approximately 11,000 bps for unmodified GSM). IBM is an active member of the H.323 ITU teleconferencing-standards consortium, and the company says that it will incorporate the H.323-compliant Codec 723 into future IC Phone releases.

The customized GSM codec proved to be quite effective, making IC Phone's audio quality better than that of most products in this roundup. It handled a full-duplex conversation quite well over our 28.8-Kbps modem connection. We experienced good sound, and delays were manageable.

After downloading Internet Connection Phone's self-extracting executable, you install the software via a setup wizard. There are currently two versions of the software: one designed specifically for computers that come with IBM's mWave sound/modem card (most notably IBM Aptivas and Thinkpads) and a version that's compatible with most other audio chip sets. Both of these versions have difficulty handling modems using v.42 error correction; the mWave-specific version is unable to function at modem speeds



SUITABILITY TO TASK		
CoolTalk		
	Power	Ease
Business use	Fair	Good
Home use	Fair	Good
Voice mail	Good	Excellent

CoolTalk is conveniently packaged with Netscape Navigator 3.0, but middling audio quality and lack of standards support make it less attractive than some competitors.

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SUMMARY OF FEATURES

Internet Telephones

PC MAGAZINE
EDITORIAL FACTS

■ YES ■ NO

Products listed in alphabetical order

	CoolTalk	IBM Internet Connection Phone	Intel Internet Phone	Internet Phone	Microsoft NetMeeting	PowWow	Quarterdeck WebTalk	TeleVox	WebPhone
General Features									
List price	Free (as part of Netscape Navigator 3.0)	Free	Free	49.95	Free	Free	49.95	Free	49.95
Native support for Windows 3.x/95/NT	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Full documentation via help	■	■	■	■	■	■	■	■	■
Full documentation via Internet	■	■	■	■	■	■	■	■	■
Support via e-mail	■	■	■	■	■	■	■	■	■
Support via Web	■	■	■	■	■	■	■	■	■
Toll-free support	■	■	■	■	■	■	■	■	■
Multipoint phone capability	■	■	■	■	■	■	■	■	■
Can search global/online users	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Personal address book	■	■	■	■	■	■	■	■	■
Connection timer	■	■	■	■	■	■	■	■	■
Can specify proxy server (firewall)	■	■	■	■	■	■	■	■	■
Off-line call notification	■	■	■	■	■	■	■	■	■
Connection									
Internet/modem/network	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Direct dial using IP addresses	■	■	■	■	■	■	■	■	■
Direct dial using e-mail addresses	■	■	■	■	■	■	■	■	■
IRC-based directory	■	■	■	■	■	■	■	■	■
Web server-based directory	■	■	■	■	■	■	■	■	■
White Pages Provider (ULS)	■	■	■	■	■	■	■	■	■
Minimum recommended speed	9,600 bps	14,400 bps	14,400 bps	14,400 bps	14,400 bps	14,400 bps	14,400 bps	9,600 bps	14,400 bps
Audio Features									
Variable sampling rates	■	■	■	■	■	■	■	■	■
Audio tuning wizard	■	■	■	■	■	■	■	■	■
Audio test facility	■	■	■	■	■	■	■	■	■
Microphone volume control	■	■	■	■	■	■	■	■	■
Speaker volume control	■	■	■	■	■	■	■	■	■
Automatic gain control	■	■	■	■	■	■	■	■	■
Voice encryption	■	■	■	■	■	■	■	■	■
Can record	■	■	■	■	■	■	■	■	■
Visual feedback on voice levels	■	■	■	■	■	■	■	■	■
Connection statistics	■	■	■	■	■	■	■	■	■
Call blocking	■	■	■	■	■	■	■	■	■
Voice mail	■	■	■	■	■	■	■	■	■
Standalone voice mail reader	■	■	■	■	■	■	■	■	■
Other Conferencing Features									
Application sharing	■	■	■	■	■	■	■	■	■
File transfer	■	■	■	■	■	■	■	■	■
Whiteboard	■	■	■	■	■	■	■	■	■
Chat	■	■	■	■	■	■	■	■	■

greater than 14.4 Kbps when error correction is enabled. You can also connect via your local intranet, as IC Phone works on standalone networks as well.

IC Phone is among the easiest phone products to use, provided that IBM's IC Phone Server is up and running. You must log onto the Internet before you start IC Phone. After initializing, it first builds a user list by querying the Phone Server. In order to call someone, you can either enter an e-mail or IP address

directly or scan the list of online users. IC Phone's setup options are rather limited, and customization options consist only of the audio-control bar and the slider bars for volume and microphone sensitivity. A simple audio-activity light flashes while you talk, and there's a mute button, which is useful during half-duplex conversations. You can use the audio-control slider bar to allot more bandwidth for improved audio, at the cost of lengthening delays. You can also

edit your user information, enter new server addresses, or configure the software for headset- or external speaker-based output.

Around the time you read this article, IC Phone will come preloaded on IBM multimedia PCs. That will jump-start IC Phone's installed base, but without a major expansion of features, prospective users may be lured away by one of the many products that offer more than IBM IC Phone does now.—Jon Hill

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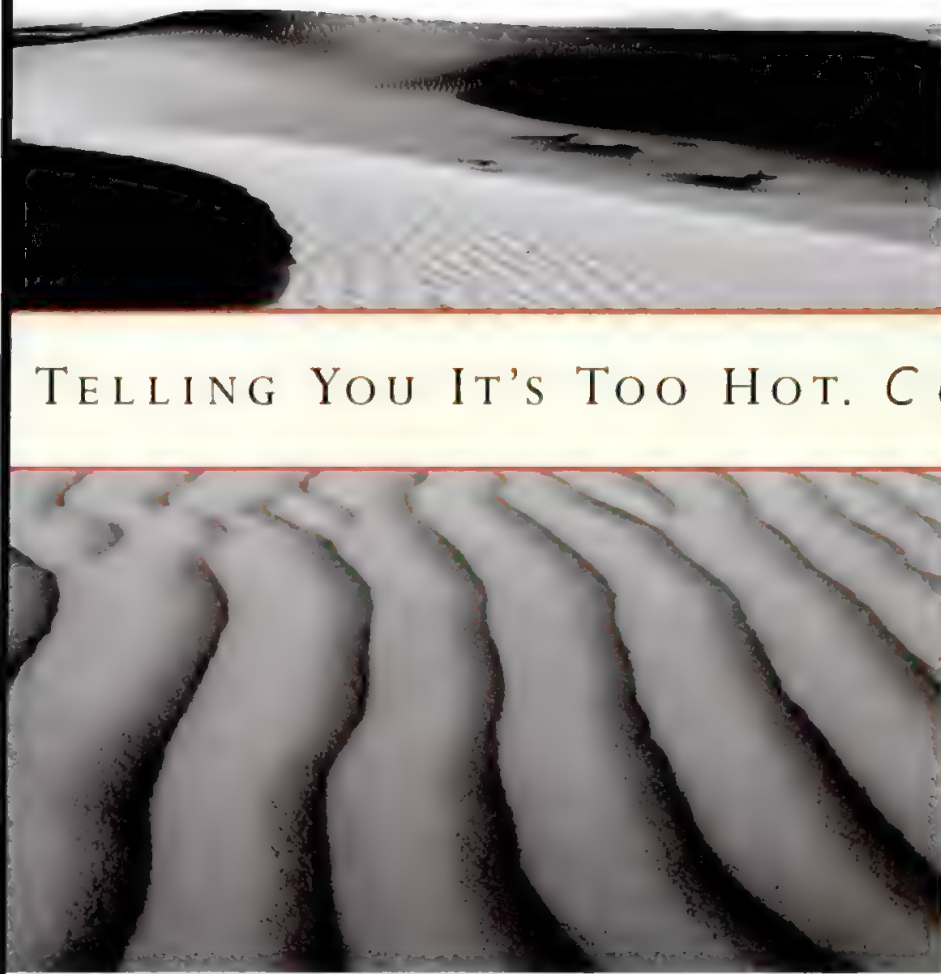
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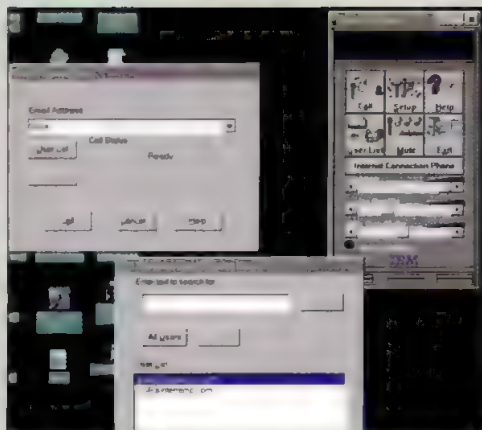
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Internet Telephones



IBM Internet Connection Phone. List price: Free. IBM Corp., Hawthorne, NY; 914-784-6327; fax, 914-784-6485; www.ibm.com. Circle 484 on reader service card.

Intel Corp.

Intel Internet Phone

Intel Internet Phone, a beta available free from Intel's Web site, is already a breakthrough product. The first phone software based on the recently ratified ITU H.323 standard for low-bandwidth audio and video conferencing, it promises interoperability with other H.323-based software, including the next releases of Microsoft NetMeeting and IBM IC Phone. Microsoft has licensed it and plans to integrate its capabilities into Internet Explorer and Windows 95.

Intel Internet Phone is also a pioneer in relying on commercial "White Pages" directory servers that comply with ULS (User Location Service) specifications. To locate other Intel Phone users, you register with and log onto one of those sites, such as Four11, Internet Address Finder, WhoWhere?, Switchboard, and Bigfoot.

Use of these directory services is an important move away from reliance on IRC or proprietary Web-based servers, which can bog down disastrously during peak hours. It's worth noting that these directory services may eventually charge you a fee, in a "give them the razor and they'll buy the blades" approach.

Intel Internet Phone is currently the sole H.323-compliant phone application, so it was impossible to test the product's interoperability with other standards-

SUITABILITY TO TASK		
IBM Internet Connection Phone		
	Power	Ease
Business use	Fair	Good
Home use	Good	Good
Voice mail	N/A	N/A

N/A—Not applicable. The product does not support this feature.

IBM's IC Phone has a clear, user-friendly interface and offers good sound quality, but it lacks features such as voice mail.

based software. H.323 compliance has other advantages, however. Codec 723, defined in the standard, consistently delivered top-quality audio in our tests; other protocols defined in H.323 helped Intel Internet Phone fly through our test scripts almost flawlessly, with minimal dropouts and very low delay times.

Intel Phone installs from a self-extracting executable that unpacks and automatically runs a Windows 95 setup wizard. The wizard modifies your System.ini file and requires a system restart. The first time you run the phone software, you choose a directory service and register your personal information.

Although you can call others directly by entering an IP or e-mail address, using the White Pages is far more powerful. You can also build a list of "Quick Dial" locations. Intel Internet Phone stores your Quick Dial numbers locally as an HTML file, so you can use your browser for nearly every phone-related function.

Intel Internet Phone is a slim bar that

snap onto your browser (either Netscape Navigator or Internet Explorer). An extremely useful companion applet, Intel Connection Advisor, occupies the Windows 95 toolbox tray and monitors H.323-compliant packets. It displays useful parameters such as processor usage, audio-quality settings, audio activity, lost packets, and amount of delay.

Intel Phone lacks several features available in other products, such as file transfers and a whiteboard. To change your White Pages provider, you must copy URLs from a separate text file into fields whose descriptions don't match the file's fields. But this is a groundbreaking product that already bests most of its competitors in audio quality and ease of use.—JH

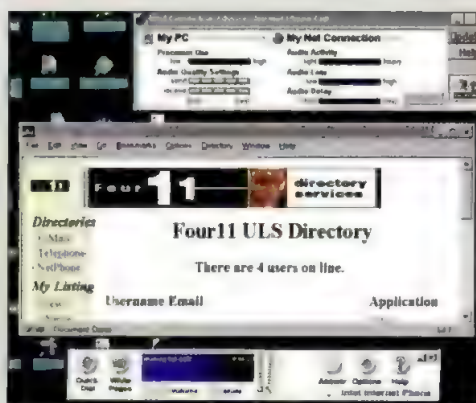
Intel Internet Phone. List price: Free. Intel Corp., Hillsboro, OR; 800-538-3373, 503-696-8080; www.intel.com. Circle 485 on reader service card.

VocalTec Inc.

Internet Phone

VocalTec's Internet Phone, Release 4 (\$49.95), hides a surprising degree of sophistication and depth beneath its whimsical interface. An IRC-based product with a large international installed base, Internet Phone provides home users with an excellent entry point into Internet-based telephony. Its dependence on VocalTec's Public Servers Network and its longish connection delays make it less useful for corporate communications.

In testing, we experienced variable connection quality, but if both caller and recipient support full-duplex operation,



SUITABILITY TO TASK		
Intel Internet Phone		
	Power	Ease
Business use	Good	Fair
Home use	Good	Fair
Voice mail	N/A	N/A

N/A—Not applicable. The product does not support this feature.

Intel's great sound quality, H.323-standard support, and use of directory services make it a phone with an eye on the future.

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SENS™ 810

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RAM	8 MB	8 MB	16 MB	16 MB	16 MB
HDD	810 MB	1.3 GB	1.3 GB	1.3 GB	2.1 GB
DISPLAY	11.3" SVGA Dual Scan Color	12.1" SVGA Active Matrix Color	12.1" SVGA Active Matrix Color	12.1" SVGA Active Matrix Color	12.1" SVGA Active Matrix Color
CD-ROM	4x CD-ROM	6x CD-ROM	6x CD-ROM	6x CD-ROM	6x CD-ROM
BATTERY	Lithium Ion	Lithium Ion	Lithium Ion	Lithium Ion	Lithium Ion
WARRANTY	3 year	3 year	3 year	3 year	3 year
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BUSINESS LEASE	\$112 per month	\$140 per month	\$170 per month	\$170 per month	\$184 per month

*Model comes standard with a PCMCIA 28.8 Modem/Fax card

SENS™ 800 (not pictured)

PENTIUM® PROCESSOR	100 MHZ	120 MHZ
RAM	8 MB	8 MB
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	LANTastic 7.0	NetWare 4.1	Windows 95	Windows NT Server
Network Software	\$499	\$2,495	\$0	\$1,129
Operating System	\$0	\$0	\$896	\$0
Additional Hardware	\$0	\$1,800	\$3,400	\$1,800
Internet Access	\$0	\$200	\$0	\$0
Remote Host	\$0	\$495	\$0	\$0
TCP/IP	\$0	\$0	\$0	\$0
Internet Gateway	\$0	\$995	not available	not available
TOTAL	\$499	\$5,985	\$4,296	\$2,929

Features

	LANTastic 7.0	NetWare 4.1	Windows 95	Windows NT Server
Dos & Windows Support	X	X		
Windows 95 Support	X	X	X	X
TCP/IP Support	X		X	X
Peer-to-peer Flexibility	X		X	X
Robust Security	X	X		X
Internet Access	X		X	
Internet Gateway	X			
Modem Sharing	X			
Remote Host	X			X
Pop-up Messaging	X			
One-Disk Add on Install	X			
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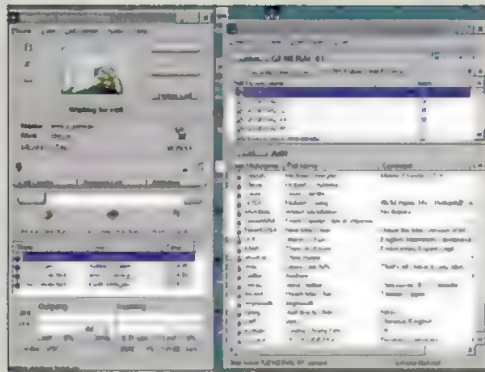
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CIRCLE 34 ON READER SERVICE CARD



SUITABILITY TO TASK		
Internet Phone, Release 4		
	Power	Ease
Business use	Poor	Good
Home use	Good	Good
Voice mail	Good	Good

With its chat rooms and large international following, Internet Phone lets you talk to old friends and make new ones

they can usually talk naturally. Internet Phone's connection delay time, which varied from 0.3 seconds to more than 2 seconds, proved more problematic. In a statistics window, you can monitor connection details such as the current codec, the percentage of lost packets, and the average connection delay.

Codec selection can be automatic; you can also choose one of Internet Phone's broad selection of supplied codecs. DSP Group's TrueSpeech has the best quality if the connection has enough bandwidth for it. Other available codecs include VocalTec's VSC and a general-purpose codec, GSM. Internet Phone detects whether your sound card supports full-duplex operation; it also works with half-duplex sound cards.

Currently you must connect via an IRC server in VocalTec's Public Servers Network, but a Web-based server was being built at press time. You can't specify a proxy server, so corporate users may have difficulty getting past their internal firewalls. You can dial an e-mail address directly from Internet Phone's main screen, but most communication occurs via the chat rooms in VocalTec's Global On-line Directory window. You can call a chat room participant by double-clicking on the person's name, but this logs you into a large public room. Unless you've put up a Do Not Disturb sign, be prepared for a stranger to call you. Although you can hang up or exit the room, the caller has your directory information after making contact.

Internet Phone lets you leave voice mail automatically if you call someone who is off-line. Windows-based voice mail recipients don't need Internet Phone to hear the message: VocalTec has a free standalone voice message player.

Internet Phone has a text chat window, which is especially helpful when line conditions falter, and it provides a whiteboard as well as file-transfer capability. You can integrate Internet Phone into HTML documents, and VocalTec has released an Internet Phone API that lets developers use DDE to integrate voice communication into other custom applications.

Internet Phone is a full-featured product that provides a good introduction to voice-enhanced Internet communications, but it is more suitable for hobbyists than for corporate users.—JH

Internet Phone, Release 4. List price: \$49.95. VocalTec Inc., Northvale, NJ; 800-843-2289, 201-768-9400; fax, 201-768-8893; www.vocaltec.com. *Circle 486 on reader service card.*

Microsoft Corp.

Microsoft NetMeeting

For sheer audio quality, Microsoft NetMeeting ranks with the leaders, and its rich whiteboard, application sharing, text chat, and file transfer tools are first-rate. Advanced audio features such as voice mail or multiparty voice conferencing are noticeably absent, however. If you want a top collaboration product that's also a phone, your search is over. If you want the most full-featured phone product available, consider other options.

NetMeeting broke new ground by supporting ITU standard T.120 for multiuser data conferencing, with its promise of multivendor voice compatibility. That said, NetMeeting currently supports simultaneous voice sessions for only two users, although it offers multiparty conferencing for all other functions.

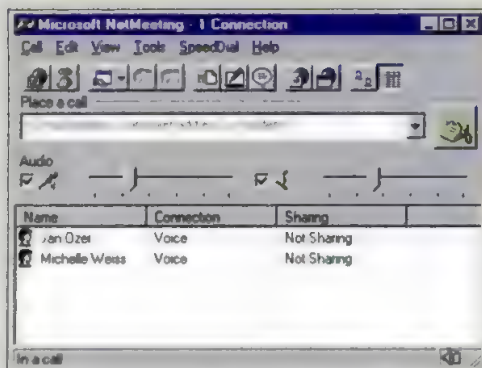
The audio tuning wizard determines whether your sound card is half- or full-duplex, asks you to enter a connection speed, and tests volume levels by prompting you to speak into the microphone. It doesn't play back the recorded audio or show levels during testing, which would be useful for troubleshooting.

The main screen includes microphone and speaker volume controls with activity indicators. There is an automatic microphone sensitivity control to eliminate ambient noise; you can override it manually. NetMeeting ships with audio codecs from Microsoft and Lernout & Hauspie, with bandwidths of 4, 8, 11, 16, and 32 Kbps. It automatically selects a codec based on the connection speed you entered during installation, although you can override these settings. Using a lower-bandwidth codec on a fast, 28.8-Kbps connection, for example, would let you improve the response of other program elements, such as whiteboard and chat.

With the 4-Kbps codec, the audio was slightly tinny, with faint echoes; at 8 Kbps or higher, these effects disappeared. In testing using the automatic configuration option with bandwidth set to "faster than 28,800 bps," NetMeeting sounded very clear and natural, better than most long-distance phone calls. NetMeeting also sailed through our full-duplex tests with a minimum of gaps or audio breaks.

There are three ways to get connected: entering an e-mail address into the phone directory; employing Advanced Calling, which lets you connect using audio, data, or both (an important feature for a conference environment, since NetMeeting supports only two simultaneous voice connections); and using Microsoft's User Location Service (ULS) server, which is useful when you don't know your party's e-mail address or just want to meet and greet on the Net. You can search through the listing by e-mail address, first and last names, city or country, or comments, and you can make a call by clicking on someone's directory information.

When you receive calls, you can elect to accept them automatically or manually. A watchdog program monitors incoming calls and lets you choose either option, even when NetMeeting isn't loaded. And a complete set of collaboration tools adds significant value to the



SUITABILITY TO TASK		
Microsoft NetMeeting		
	Power	Ease
Business use	Good	Good
Home use	Good	Good
Voice mail	N/A	N/A

N/A—Not applicable. The product does not support this feature.

NetMeeting impresses with its audio and standards support, but with no voice mail or multiparty voice conferencing, it is not a total Internet phone solution.

product if you want to do more than chat. NetMeeting delivers the audio basics well, but its lack of advanced calling functions keeps it from being a complete phone solution. —JO

Microsoft NetMeeting. Price: Free. Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080; fax, 206-635-1049; www.microsoft.com. Circle 487 on reader service card.

Tribal Voice PowWow

PowWow, from Tribal Voice, targets Net-savvy users and gives them a place to get together and compare notes. More of a cybercommunity than a telephone replacement, PowWow will let you connect with fellow users over their servers, but we found the resulting audio quality to be poor and the conversations stilted and worse. PowWow also includes whiteboard, chat, and file-transfer modules.

Very little is automatic with PowWow. The program is available only from Tribal Voice's Web site, and the downloadable ZIP file is not self-extracting. After you unzip the files into a directory that you create, you have to add the program to your start menu or program manager since PowWow doesn't do this for you. If you launch PowWow before you've made your Internet connection, the program makes no attempt to make the connection for you—or even prompt you with a reminder to do it yourself. Unless you're dialing someone directly, you should also make sure that your browser of choice is up and running before loading the program, because you can't launch it

from within PowWow to access any of the browser-based functions, such as the user database.

Tribal Voice employs the GSM codec in PowWow, and we found that attempting to hold a full-duplex conversation was an exercise in frustration. In our testing, whenever both parties spoke at the same time for extended periods, the audio dropped out for long stretches, with occasional fragments of speech popping up in seemingly random order. PowWow fared much better in half-duplex mode, but it is tough to hold a normal conversation when only one person can speak at a time. For future versions, Tribal Voice has licensed the RT24 codec from TeleVox; it squeezes audio into streams as small as 2,400 bps and will allow PowWow users to use ultraslow modem connections.

After registering with a PowWow server, you can call other PowWow users directly via their e-mail address, search a list of recently logged-on users, or join or start a conference with up to seven people. Most PowWow users interact via Tribal Voice's White Pages by accessing the company's own registration server,

but larger or more advanced groups can set up their own PowWow server or join a preexisting *tribe*—a pointer to a set of conferences loosely organized by topic. Thus, fans of the X-Files TV show can click on the TV/Movies section and join the X-Philes tribe.

PowWow includes a call-blocking address book where you can prevent undesirable callers from reaching you just by entering their e-mail addresses. If you don't have a sound card, you can still use PowWow's nonvoice features; only the voice modules remain inactive.

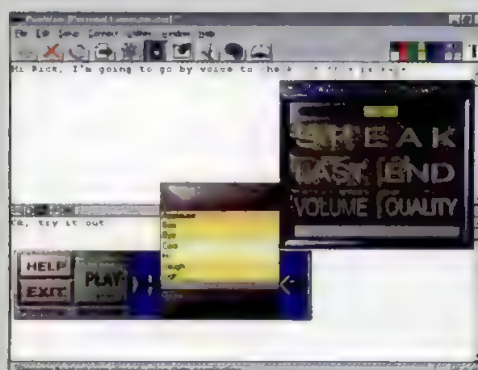
PowWow lacks the robust business-oriented features of packages such as WebPhone, but if you're looking to socialize in a chat-room atmosphere and don't mind enduring the ham-radio quality of the conversations, PowWow may be just the ticket. —JH

PowWow. List price: Free. Tribal Voice, Woodland Park, CO; 719-687-0480; fax, 719-687-0716; www.powwow.com. Circle 488 on reader service card.

Quarterdeck Corp. Quarterdeck WebTalk

If you want to use the Internet to talk to friends, business contacts, or total strangers, Quarterdeck WebTalk wants to get you up and running. This \$49.95 (list price) Internet telephone is packed with features and some nice extras, but in trying to provide something for everyone, it doesn't fully cover the needs of any one group of users.

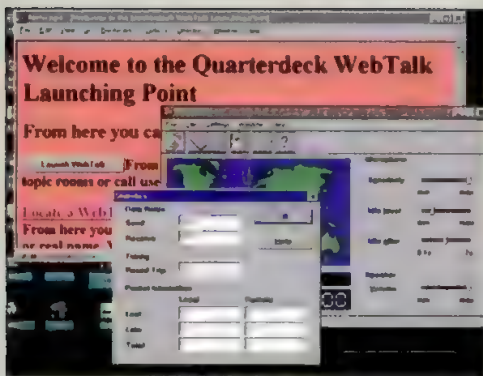
Although it includes everything you need to log onto the Internet, its installation process may confuse novices. Experienced users will appreciate its Audio Statistics tool and the ability to specify a



SUITABILITY TO TASK		
PowWow		
	Power	Ease
Business use	Fair	Fair
Home use	Fair	Fair
Voice mail	N/A	N/A

N/A—Not applicable. The product does not support this feature.

PowWow offers the best chat community in the roundup, but you must sacrifice audio quality in return.



	SUITABILITY TO TASK	
	Quarterdeck WebTalk	
	Power	Ease
Business use	Good	Fair
Home use	Good	Good
Voice mail	N/A	N/A

N/A—Not applicable: The product does not support this feature.

WebTalk offers a total solution for those starting from scratch, but if all you need is a phone, others can provide more functionality or more fun.

proxy server address but may pine for a business-oriented program that includes voice mail functionality, file transfer, or a whiteboard.

If you are starting from ground zero and don't already have an Internet service provider, Quarterdeck's Connect And Play software can help you find and sign up with one. The package comes with Quarterdeck Mosaic and QWinsock in addition to its phone software, but WebTalk also works well with Netscape Navigator or Microsoft Internet Explorer using most 32-bit winsocks.

After you install the program, you log onto Quarterdeck's Launching Point Web page through your Web browser. You can't bring up the browser from within WebTalk, so unless you know the permanent IP address of the person you wish to call, sessions begin with the browser.

Quarterdeck WebTalk supports an impressive array of audio codecs, including TrueSpeech, RT24, and ADPCM, although it ships with only the Lernout & Hauspie codecs. It is also the only package that includes a small microphone. The software automatically detects whether your sound card can support full-duplex communications and automatically chooses a codec for you if you haven't specified one.

If you need to talk through a network firewall, WebTalk's Location Manager lets you enter the address of your proxy server and specify domains on either side of the firewall, effectively managing both intranet and Internet addresses. WebTalk's Audio Statistics tool tracks such important information as the number of packets sent or received, number of packets lost, and your actual connection bandwidth, so you can change codecs if need be.

On our performance tests, when using

the default codec, WebTalk was able to deliver acceptable audio quality with a fairly low delay, but we strained to hear its low-decibel output even after manually setting its audio controls to full volume. To its credit, WebTalk was one of the few products to successfully complete our full-duplex test with minimum dropout or audio delay. Thus, as long as you speak up, you can converse fairly normally.

Neither a full-fledged business package nor a hobbyist phone, Quarterdeck WebTalk straddles the middle. If you're starting from scratch without a browser and Winsock, this bundle offers what you need. If you're already connected, other products in this review offer more functionality or more fun.—*JH*

Quarterdeck WebTalk. List price: \$49.95. Quarterdeck Corp., Marina Del Rey, CA; 800-683-6696, 310-309-3700; www.quarterdeck.com. *Circle 489 on reader service card.*

Voxware Inc.

TeleVox

TeleVox sidesteps ho-hum voice communications to give Internet telephony a more whimsical spin. Based on Voxware's ultralow-bandwidth MetaVoice speech compression technology, TeleVox lets you alter the tone and character of your voice during your cyberspace chats. The free, downloadable package also excels at squeezing human speech down into the smallest possible space, so over very slow modem lines it may well represent your best bet. Over more normal connections, and with its voice-warping features turned off, TeleVox proved to be an undistinguished performer.

The heart of TeleVox is Voxware's

MetaVoice audio compression technology, which is focused solely on voice communications. The company's RT24 codec compresses speech into a data stream as narrow as 2,400 bps. Because the software processes your voice in large batches before sending the compressed stream out over the Net, we found that real-time full-duplex communication was nearly impossible. If you stick to short sentences, you should be all right, but anything longer than a few seconds tends to confuse the codec. Reading a short paragraph over the Net was an exercise in frustration. Sentence fragments occasionally bubbled up from the ether minutes after they had been uttered, in apparently random order.

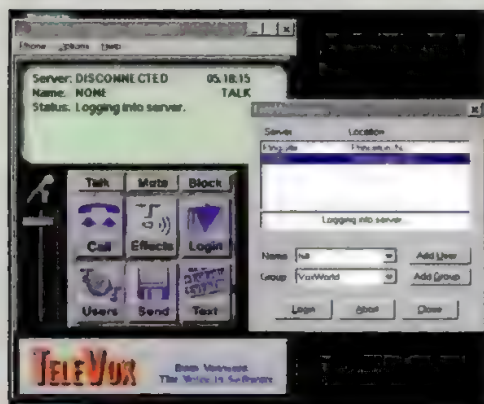
The software, which we tested in beta, arrives as a self-extracting executable file. The installation unpacks the program files into a newly created directory, after which you're ready to create your user profile and log into Voxware's chat-based server. You can make direct calls to a known IP address, but to find users by their e-mail address, you need to go through the servers. The main TeleVox window consists of a pull-down menu, a current-status window, and large buttons that lead to major functions. These include call initiation, changing the special voice effects, searching the on-line user database, sending a file, and starting a text-based chat session. Slider bars are provided to control the microphone and speaker volumes.

TeleVox includes VoiceFonts, a voice distortion technology that you can use to make yourself sound like Robby the Robot or Clint Eastwood with a bad cold; you can also add echoes of various lengths. Voxware also offers a companion product for developers that lets them create custom VoiceFonts. It's easy to see where the company is going with this: RT24 has already been licensed by multiplayer gaming vendors, and eventually you'll be able to grunt at evil demons and enemy players in their own language.

Portions of Voxware's MetaVoice technology have been incorporated into Netscape's CoolTalk and Tribal Voice's PowWow phone products, and VDOnet uses the RT24 codec in its videoconferencing product, reviewed in the next sec-

COVER STORY

Internet Telephones



SUITABILITY TO TASK		
TeleVox		
	Power	Ease
Business use	Poor	Poor
Home use	Fair	Fair
Voice mail	N/A	N/A

N/A—Not applicable. The product does not support this feature.

Voice compression technology that enables a set of voice distortion routines gives TeleVox the most toylike feel of any phone in this roundup.

tion. But in this incarnation, the technology is more useful as a static compressor (for example, using it to attach highly compressed audio to a Web page) than in real-time situations. On the other hand, if you've always wanted to sound like Aaron Neville or Lurch from the Addams family, and you tend to talk in short staccato sentences, the era of ultralow-bandwidth audio has arrived.—JH

TeleVox. List price: Free download. Voxware Inc., Princeton, NJ; 888-866-5869, 609-514-4100; fax, 609-514-4104; www.voxware.com. *Circle 490 on reader service card.*

NetSpeak Corp. **WebPhone**



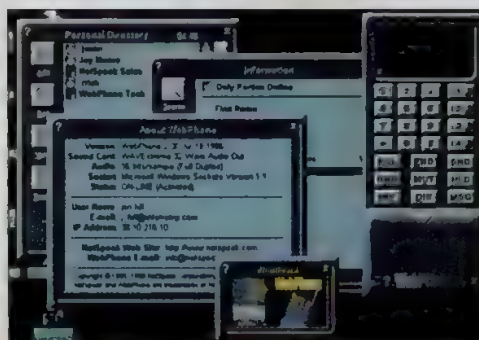
WebPhone 2.0 (\$49.95 list), from NetSpeak Corp., delivers clear, crisp audio that tops all comers in this roundup, and it includes a host of useful features that are uniquely tailored for business application. The product's design emphasizes an uncluttered, elegant appearance over easy access to setup options, but it packs a great deal of functionality into its deceptively simple cell-phone interface.

WebPhone sailed through our test scripts, handling long full-duplex conversations with ease. Audio quality was approximately what you'd expect from a good analog telephone, but note that WebPhone's best-quality codec, DSP Group's TrueSpeech, needs at least a Pentium CPU and a 28.8-Kbps connection in order to function properly. Slower processors and lower-bandwidth con-

nections necessitate using the somewhat less-capable GSM (Global Systems for Mobile Communications) encoding scheme. WebPhone works on any TCP/IP network, but the current version has problems with proxy servers behind firewalls, something that the company expects to have corrected by the time you read this article.

WebPhone provides an array of features that are ideally suited for the business user. It can handle up to four point-to-point calls at a time, but only one line can be active at a time. The phone places on hold any callers on inactive lines, but you can then conference them together on a single line (in half-duplex mode, subject to bandwidth restrictions) simply by dragging and dropping an inactive-line icon onto an active one. Additionally, you can transfer calls to any user who is in your personal directory.

WebPhone's call-management options are without peer. The product offers automated voice-messaging via e-mail, and it allows you to create customized outgoing messages for individual callers. You can even entertain callers on hold with MIDI-based music.



WebPhone lets you block or restrict to voice mail any calls from specific numbers, so you can easily avoid annoying random callers looking to chat. You can also allow certain users to punch through your Do Not Disturb sign.

Finding, setting up, and using WebPhone's many features can be a bit of a challenge because of the company's desire to present a simple interface. For example, to adjust the VOX Delay and Speaker Delay slider bars manually, you have to type *sliders=on* into the WebPhone Number field and press the SND (send) button or enter. To access information on software revisions or the About WebPhone box, you double-click on the word "WebPhone" in the cellular display. Neither procedure is difficult, but the way they are presented is not particularly intuitive. Two separate Windows Write files constitute the offline help.

To place a call, you select a free line and enter an IP or e-mail address into the WebPhone Number field. You can also search a global directory of online users or double-click on an entry in your personal directory.

WebPhone is a serious tool, not a toy: You won't find animated figures jumping up and down on your screen when you make a connection, chat rooms full of teenagers, or voice distortion routines that turn you into Walter Cronkite or Darth Vader. A few quirks notwithstanding, this is a clearly superior voice-communications product, packed with features carefully targeted at professional needs.—JH

WebPhone 2.0. List price: \$49.95. NetSpeak Corp., Boca Raton, FL; 561-997-4001; fax, 561-997-2401; www.netspeak.com. *Circle 491 on reader service card.*

SUITABILITY TO TASK		
WebPhone		
	Power	Ease
Business use	Excellent	Good
Home use	Excellent	Good
Voice mail	Excellent	Good

WebPhone's easy-to-use, slick cell-phone interface keeps it simple, but the tremendous functionality of the product lies within.

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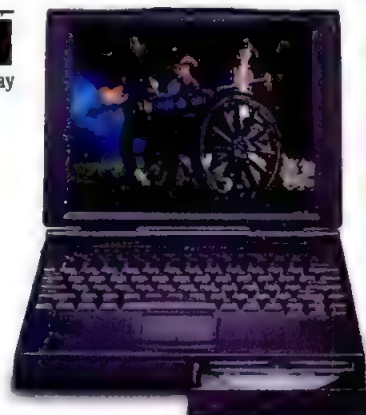
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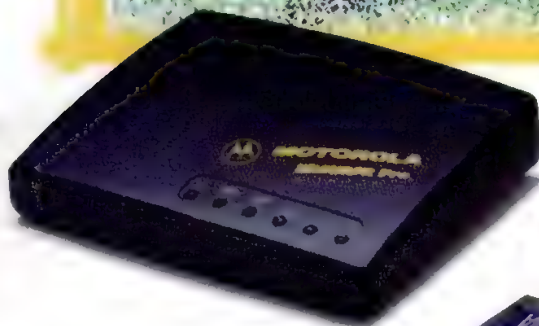
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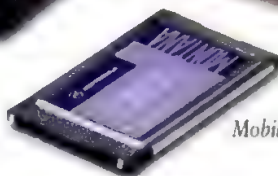
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CineCom Corp.

CineVideo/Direct

ALL REVIEWS BY JAN OZER

CineVideo/Direct, from CineCom Corp. (\$39.95 list price), is a two-party conferencing system that provides good video quality across a wide range of bandwidths. It works across a modem connection or a TCP/IP network, and it proved to be exceedingly easy to use.

The product's proprietary video codec functions quite well in a conferencing setting, where most video output has only one subject and a relatively stable background. The codec employs edge detection and other techniques in order to distinguish the

main subject from the background. It then filters and homogenizes the background pixels, thus increasing compression efficiency and improving low-bandwidth quality. CineVideo monitors connection bandwidth and scales video content, giving priority to audio to avoid sound breaks.

When we tested CineVideo at T1 speeds, we generally achieved better than four frames per second (fps) for both transmitting and receiving. The frame rates slipped to about two fps in both directions during our 28.8-Kbps tests. They dropped further when we transmitted audio.

Frame quality remained consistently high in all tests and at all bandwidths. Whereas motion tended to cause artifacts

in most other technologies, CineVideo reacted with only slight blurring and a minor decrease in frame rate. At worst, CineVideo images looked a bit soft and less defined.

CineCom offers two derivatives of the GSM audio codec: a 6-Kbps Radio option and an 8-Kbps Phone option. Both sounded very clear during our testing, with little discernible difference between them in quality. At high bandwidths we experienced very little audio dropout, and conversations sounded fairly natural. At lower bandwidths audio gaps became more prevalent, requiring slower, more deliberate speech.

Because the program adjusts for varying bandwidths automatically, CineVideo has few setup options to baffle the non-technical user. Installation was very simple, as the program automatically recognized and set up our video and audio hardware, asking no configuration questions.

All of CineVideo's functionality lies in one of its four windows. The CineVideo/Direct window is the control center, from which you dial and connect to other conferees. It displays local and remote IP addresses, inbound and outbound fps rate, and call status. It also shows a list of currently connected users; you can dial from this list, or you can enter an address and dial directly.

There is no provision for receiving a call when the program isn't running, but when it is operating you can opt to refuse all calls.

INTERNET VIDEOCONFERENCING

How to Read the Suitability to Task Boxes

Low-bandwidth conferencing We looked for a selection of codecs specifically tuned to maintain acceptable quality over a 28.8-Kbps modem link. Even better was an adaptive codec that scaled the data-stream to accommodate varying bandwidth availability. Under low-bandwidth connections, the product should be able to deliver 1 to 2 frames per second or at least an unbroken audio stream. Products with extremely slow frame refresh or significant audio dropouts did not fare well here. We looked for easy setup options to optimize for low-bandwidth conditions and deducted points if the user was forced to make a series of arcane adjustments. Tools that let the user track statistics such as bandwidth, frame rate, and packet loss earn extra points.

SUITABILITY TO TASK		
Product name		
	Power	Ease
Low-bandwidth conferencing	Fair	Fair
High-bandwidth conferencing	Good	Good
Multiparty conferencing	Excellent	Excellent

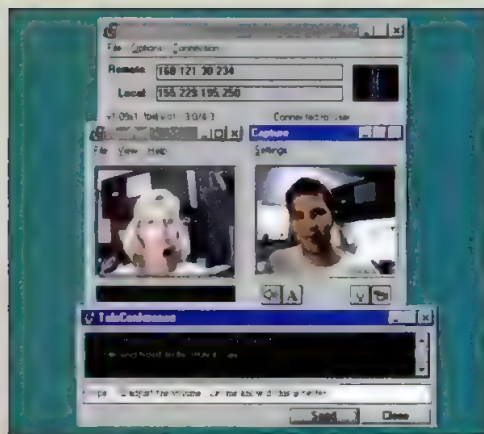
High-bandwidth conferencing We looked for a video codec or series of codecs that can take advantage of faster connections. Frame rates from 5 to 7 fps or above (using standard videocams) were considered strong. We also looked for high-quality audio and deducted points if only low-bandwidth audio codecs were provided. Products that could not provide

video/audio synchronization also lost points in this task. We checked to see if the video codec could maintain a reasonably artifact-free transmission over extended periods of time when imaging a single "talking head" subject against a relatively stable background.

Multiparty conferencing The ideal video product will support true multipoint conferencing in which multiple users appear simultaneously on multiple screens. Less desirable is a single-to-multipoint scenario in which one user appears on many screens. Products that offered additional conferencing tools such as chat, whiteboard, and file transfer earned extra points, as did tools that allowed cross-platform connections to Macs or other non-Windows systems.

COVER STORY

Internet Videoconferencing



You can also screen incoming calls by requiring callers to enter a password before connecting. The program displays the caller's video but doesn't transmit your own until the caller enters the password. You can send the password to a first-time caller via the TeleConference chat window.

The Capture window is the local video screen, which contains all audio and video configuration options. Your only video options are frame rate and the choice of color or black-and-white video, and the only audio control is a toggle between the Radio and Phone options. Once you accept a call, CineVideo offers an inelegant but workable aid to half-duplex operation: Each conferee presses a microphone button below the capture window to speak, and a light on the ViewPort, which shows the remote conferee, helps smooth conversations by warning each user of incoming audio messages. The ViewPort, which shows the remote conferee, also offers the options of zooming in by a factor of two or stretching the window to any arbitrary size.

CineVideo doesn't have microphone or speaker volume controls, and the product provides you with no visual feedback on voice levels, making it difficult to tell whether you're transmitting or receiving. The program's windows remain in the foreground even when you select other applications on the desktop, which makes it difficult to work with other programs during the conference. Still, these deficiencies can't overshadow CineVideo's ease of use and its good audio/visual quality at low and high bandwidths alike. It's a solid choice for all point-to-point videoconferencing. **CineVideo/Direct.** List price: \$39.95. CineCom Corp., Woodbridge, VA; 888-

246-8101, 703-680-4733; fax, 703-680-1697; www.cinecom.com. **Circle 498 on reader service card.**

Connectix Corp.

Connectix VideoPhone

Originally developed as an adjunct to the company's QuickCAM video camera, the \$99 Connectix VideoPhone now aims to be a top performer in its own right. It boasts strong high-bandwidth performance, but it is confusing to set up and operate, a bit unstable, and a poor low-bandwidth performer. VideoPhone isn't quite there yet.

VideoPhone provides point-to-point and point-to-multipoint transmissions, but it doesn't enable true conferencing, in which all conferees are visible on multiple screens. It works over the Internet, over IPX networks, and via modems.

At T1 connection speeds, with 160-by-120 resolution, we achieved crisp, sharp video at 8 to 10 frames per second (fps) and exceedingly clear audio. At 128 Kbps



SUITABILITY TO TASK		
Connectix VideoPhone		
	Power	Ease
Low-bandwidth conferencing	Poor	Fair
High-bandwidth conferencing	Good	Fair
Multiparty conferencing	Fair	Fair

Connectix VideoPhone performs admirably at high bandwidths but slips over modem connections. Setup is challenging at any speed.

we maintained 7 to 9 fps without significant quality degradation by selecting the National Semiconductor codec, which uses a motion threshold detector to freeze most background motion and transmit only true movements.

We maintained high video quality even with a 28.8-Kbps connection, though we had problems connecting at this speed. But the display rate dropped to a glacial single frame every 3 or 4 seconds. Audio, which had transmitted with few delays or breaks at ISDN speeds and above, broke up frequently and was largely unusable.

Configuring VideoPhone involves setting up to six controls, some cryptic and all labor-intensive. First you set connection bandwidth, the maximum rate for data transmission from your computer. This is only your own share of the total connection bandwidth, so you and the other conferees must set a collective connection bandwidth. You also set an fps rate for the remote systems' transmissions to you, even though bandwidth will often limit it if you don't connect at ISDN speeds or faster.

The availability of options is usually a virtue, but VideoPhone's four low-bandwidth codecs, licensed from National Semiconductor, offer almost too many choices. The program is compatible with Video for Windows (VFW), so it should work with all VFW capture cards and with audio and video codecs.

Choosing your video compression method is a trial-and-error process. At high bandwidths, you choose between the VIDEQ codec (included in the QuickCAM unit) and uncompressed video in thousands or millions of colors. If an error message informs you that the "video data is too large," you abandon the VIDEQ codec in favor of

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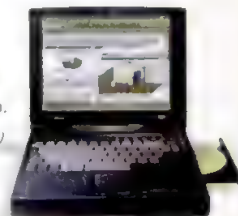
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SOFTWARE TESTING

Internet Videoconferencing



Our tests revealed plenty of variation among the products. The best were easy to use and handled varying bandwidth with aplomb, even down to modem speeds. Others were finicky, hard to configure, and poor performers at low bandwidths.

How We Tested

We conducted our video tests across real-world Internet connections, and we attempted to employ all of the video codecs that came with each package, both with and without audio where this was possible. Our connection speeds varied from a typical active T1 connection down to a 28.8-Kbps modem. We employed a standard background as our subject source, and we shifted from a static talking head to increasing amounts of movement in the frame, observing along the way any changes in image quality. The frame rates that we note in the reviews are averages, based on the statis-

tics reported by the tools and confirmed by our visual inspection.

Our test-bed systems were Micron Millennia Plus Pentium 133 PCs with 16MB of RAM, ATI Mach64 PCI video cards, Sound Blaster AWE32 audio cards, and Andrea ANC 500 telephony headsets. To connect to the Internet, we used Practical Peripherals PM288MT II modems for 28.8-Kbps hookups, as well as connections to our corporate T1 line through our internal 16MB Token-Ring LAN via Proteon 1392 cards.

To this basic platform we added Connectix QuickCAM and Connectix ColorCAM video cameras. The Connectix units are inexpensive and nearly ubiquitous, and they are the cheapest and most popular route to delivering video over the Internet. They do not require a capture card.

The QuickCAM also devours a substantial portion of CPU overhead, even on a Pentium 133, and this can limit the performance of high-end video codecs. For this reason, we invited the vendors to conference with us from a system of their choice, testing at a range of bandwidths and connection speeds; we incorporated these anecdotal results into our reviews.—*Jay Munro and Jan Ozer*

one from the Compression Options box, which includes National Semiconductor's and all other VFW codecs.

Next you select video compression options. VideoPhone's best codec, ADPCM, is the default one in a network setup, but it occupies too much bandwidth for use with a 28.8-Kbps modem connection. Lower-bandwidth codecs are available, but we found them unreliable.

You'll have to reduce screen resolution and image sharpness if video compression remains too large. Dropping to 160-by-120 resolution and selecting medium sharpness should meet most bandwidth targets.

Once past the setup process, you'll find that program operation is fairly simple and that the controls provide both flexibility and functionality. VideoPhone provides icon and menu bars above a small video window. The self-view is a free-floating window that displays raw camera output, useful for positioning the camera. Options for the size of received video range from 50 percent to 200 percent to full-screen. And the program's frame-capture utility captures and outputs video frames in .BMP, .PCX, TIFF, .WPG, and .PCT format.

VideoPhone supplies the tools you need for half-duplex operation: controls for audio threshold and for line turnaround time. After we worked with them briefly, conversation sounded quite natur-

al. VideoPhone is one of the few products we tested that has no audio-volume meter, and volume controls aren't conveniently located on the main screen. A status light above the menu bar gives audio feedback.

You make a call by selecting a user's listing in the phone directory or by dialing into Connectix's user database. On the receiving end, you can accept all calls automatically or answer them selectively. You can also set the program to monitor all enabled ports and launch VideoPhone if a call comes in when it isn't running.

While VideoPhone has some bright spots, its complicated setup will challenge nontechnical users, and its low-bandwidth performance was unremarkable. Until Connectix addresses these issues, most users will be better-off with other products. **Connectix VideoPhone.** List price: \$99. Connectix Corp., San Mateo, CA; 800-950-5880, 415-571-5100; fax, 415-571-5195; www.connectix.com. *Circle 495 on reader service card.*

White Pine Software Inc.

Enhanced CU-SeeMe

White Pine Software's Enhanced CU-SeeMe (\$99 list), based on the well-known Cornell University CU-SeeMe, is the only reviewed videoconferencing product that supports multi-

point conferencing or has Windows/Mac cross-platform compatibility. Its audio and video codecs produced good quality at high bandwidths, though they were far less satisfactory at modem speeds. Setup is taxing, but the product is feature-rich and is easy to use once you're past this hurdle.

CU-SeeMe can operate point-to-point or support up to 100 simultaneous multipoint conferees, and each user can select which conferees to view. Multipoint use requires the White Pine Reflector server, which is priced according to the number of connections needed. For basic point-to-point conferences, a simpler product than Enhanced CU-SeeMe may fit the bill, but it's well worth investigating for multipoint communication.

TOPFLIGHT CODECS

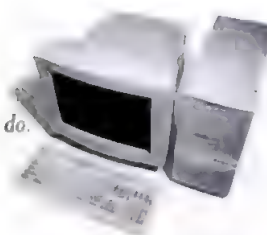
CU-SeeMe incorporates a roster of well-known high-quality codecs, including Crystal Net's SFM video codec, Voxware's speech-oriented AudioVox codec (tuned for ultraslow 2,400-bps connections), and Rockwell's DigiTalk, which offers better quality over a range of input types at 8.5 Kbps.

At connection speeds of 60 to 90 Kbps, these codecs delivered very good audio and video and a frame rate of about 5 to 7 fps—as long as the subject re-



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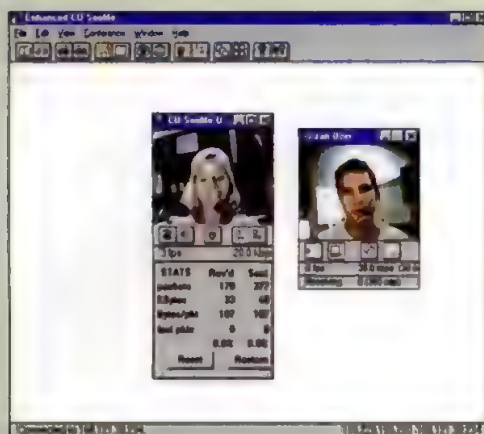
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COVER STORY

Internet Videoconferencing



mained relatively still. Fast movements caused significant image distortion, though it generally disappeared when the motion stopped.

The DigiTalk codec consistently produced very clear audio over these higher-bandwidth connections, but CU-SeeMe has no provision for audio/video synchronization, so facial movements often preceded audio by one or two seconds.

Performance degraded dramatically over a 28.8-Kbps modem connection. Frame rates dropped to 1 to 2 fps, and there were frequent audio breaks even with the Voxware audio codec. With newly established connections, the video frame appeared slowly, often block by block or line by line. At both high and low bandwidths, picture quality and frame rate improved when we used grayscale video, a user-selectable option.

Customizing these bandwidths is not for the meek. After choosing the connection bandwidth for transmission and reception, you face a wide range of video compression options, such as "Smeared I Frame Rate" and "ME Search Radius." They can significantly enhance video quality and will delight the technophile but are far too complex for the average user.

Otherwise, CU-SeeMe is extremely easy to use for point-to-point conferencing, starting with its CD-ROM-based installation program, which got us up and running in minutes. The program itself runs either as a menu bar or full-screen. A status bar lists local and remote IP addresses and program status. The windows for local and remote video and audio control run in child windows, all of which are accessible from the taskbar or from the main interface.

SUITABILITY TO TASK

Enhanced CU-SeeMe

	Power	Ease
Low-bandwidth conferencing	Fair	Good
High-bandwidth conferencing	Good	Good
Multiparty conferencing	Excellent	Good

The only product we saw that can do multi-point videoconferencing, Enhanced CU-SeeMe proves to be an impressive and straightforward package after initial setup hurdles.

You can transmit audio, video, or both when you place or receive calls. And when you receive calls, CU-SeeMe notifies you, even when the main program isn't running. The call notification box contains the caller's IP address; you can decline the call.

During conferences CU-SeeMe reports important connection statistics, such as transfer bandwidth, send/receive frame rate, and lost packets. It also provides useful information for remote troubleshooting, such as remote transfer settings and version number.

CU-SeeMe has other enhancements, including a chat applet and the ability to overlay text over the remote video, which is useful for diagnosing audio problems and for relaying other short messages. White Pine's whiteboard offers screen capture, a remote pointer, and view synchronization, making it one of the better ones we saw. CU-SeeMe's first-rate help and online user documentation round out the bundle.

In its present form, Enhanced CU-SeeMe may be too complex for the mass market, and its low-bandwidth performance is underwhelming. But at high

bandwidths, it delivers video that's worth watching.

Enhanced CU-SeeMe. List price: \$99; White Pine Reflector, with 10 connections, \$395. White Pine Software, Nashua, NH; 603-886-9050; fax, 603-886-9051; www.wpine.com. Circle 492 on reader service card.

VDOnet Corp.

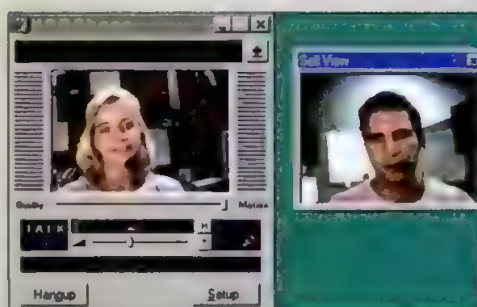
VDOPhone Internet



A veteran player in the Internet video market, VDOnet Corp. has funneled its considerable technology and application experience into VDOPhone Internet, an innovative \$99 product with an exceptionally easy-to-use interface. The only downside is that using VDOPhone with Connectix's CPU-hogging Color Quick-CAM reduces the potential display rate to about 2 frames per second (fps). Maximizing VDOPhone's potential requires a dedicated video-capture board and camera or a less power-hungry videocam.

VDOPhone is a two-party, point-to-point system that uses UDP for its audio/video transport mechanism. The product combines two high-tech codecs—VDOnet's VDOWave video codec and Voxware's ToolVox audio codec—into one compact, high-quality audio/video stream.

VDOWave is a wavelet-based algorithm that provides high-quality, low-bandwidth performance and a scalable architecture that can serve a wide range of delivery bandwidths. During encoding it divides each frame into multiple layers, each adding more detail. With enough transfer bandwidth, it sends all layers, for optimum quality. When bandwidth constricts, it transmits fewer layers; video quality degrades and playback



SUITABILITY TO TASK

VDOPhone Internet

	Power	Ease
Low-bandwidth conferencing	Good	Good
High-bandwidth conferencing	Excellent	Excellent
Multiparty conferencing	N/A	N/A

N/A—Not applicable. The product does not support this feature.

VDOPhone's superior technology and ease of use make it a top performer.

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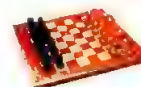


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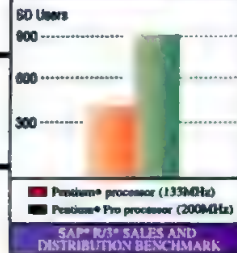
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SUMMARY OF FEATURES

Internet Videoconferencing

PC MAGAZINE
EDITOR'S CHOICE

■ YES ■ NO

Products listed in alphabetical order

	CineVideo/Direct	Connectix VideoPhone	Enhanced CU-SeeMe	VDOPhone Internet
General Features				
List price	\$39.95	\$99.00	\$99.00	Free
Native support for Windows 3.x/95/NT	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Full documentation via help	■	■	■	■
Full documentation via Internet	■	■	■	■
Support via e-mail	■	■	■	■
Support via Web	■	■	■	■
Toll-free support	■	■	■	■
Multipoint capability	■	■	■	■
Can search global/online users	■ ■	■ ■	■ ■	■ ■
Personal address book	■	■	■	■
Connection timer	■	■	■	■
Off-line call notification	■	■	■	■
Internet connection	■	■	■	■
Modem connection	■	■	■	■
Network connection	■	■	■	■
Minimum recommended connection speed	14,400 bps	28,800 bps	28,800 bps	14,400 bps
Feature negotiation	■	■	■	■
Adaptive encoding	■	■	■	■
Video Features				
Maximum resolution	160 x 120	240 x 180	120 x 160	320 x 240
Self-view	■	■	■	■
Half-size video scaling	■	■	■	■
Double-size video scaling	■	■	■	■
Audio Features				
Variable sampling rates	■	■	■	■
Audio tuning wizard	■	■	■	■
Microphone/speaker volume control	■ ■	■ ■	■ ■	■ ■
Automatic gain control	■	■	■	■
Can record	■	■	■	■
Visual feedback on voice levels	■	■	■	■
Connection statistics	■	■	■	■
Voice mail	■	■	■	■
Call blocking	■	■	■	■
Other Conferencing Features				
Application sharing	■	■	■	■
File transfer	■	■	■	■
Whiteboard	■	■	■	■
Chat	■	■	■	■

* VideoPhone ships with Quarterdeck TalkShow, which includes this feature.

frame rate slows, but audio breaks are minimal.

The scalable architecture lets VDOPhone use one video and one audio codec for all bandwidths, letting users avoid codec selection and the other confusing setup issues that plagued other products. VDOPhone also maximizes video quality over the Internet's fluctuating bandwidths.

The downside is the processing power needed to compress the video. In testing with a Pentium 133 that could produce up to 7 or 8 fps with other video codecs than

this product's, VDOPhone produced only 2 fps. On VDOnet's "best-case" system, which had the recommended hardware—a PCI-based capture card and an NTSC camera—VDOPhone was able to produce up to 10 fps.

Quality was quite good at ISDN speeds and higher, with some compression artifacts that became more pronounced at 28.8 Kbps. With a 28.8-Kbps connection on the "best-case" system, VDOPhone maintained 5 to 6 fps, and artifacts were not severe as long as motion was minimal.

When we tested using high-contrast backgrounds (such as our labs) with many small, discrete bits of video information, the video artifacts worsened until the image was unrecognizable. In less challenging environments, the codec lasted 15 to 20 minutes without doing this. Our grayscale test camera produced much better quality than the color camera did, since grayscale data is more compact than color.

Audio was a touch tinny, something we've seen with other Voxware products. Like most of its competitors, VDOPhone gives audio priority over video so it can remain unbroken even at low bandwidths. While the Voxware codec was finicky when it came to microphone placement and audio level, we soon arrived at a configuration producing minimal audio dropouts, and use became reasonably comfortable over time. The user interface keeps all critical controls at hand, so tweaking to achieve the best audio quality is easy. On-screen at all times are the microphone volume control, meter (which shows the audio volume), Talk and Listen indicators, and mute button.

VDOPhone's NetAnalyzer tracks transfer bandwidth, capture and display frame rates, and packet loss, supplying useful data for diagnosing problems. Other features include a simple chat window (which becomes incredibly useful if your audio disappears), a self-view showing local-camera feedback, an event log, a conversation timer, and 200 percent display magnification.

VDOPhone's single codec makes installation effortless, and we were ready for a conference in moments. The program supports a server-based collection of contact points, as well as direct dialing via e-mail or IP address. You can screen, auto-answer, or block all incoming calls, but VDOPhone does not have a watchdog to take calls when the program isn't loaded.

VDOnet also offers VDOPhone Dual Mode (\$199), which has all the Internet functionality but can also run over regular phone lines. With VDOPhone, VDOnet offers a product that's both technically superior and easier to use than most alternatives. It's well worth a look.

VDOPhone Internet. List price: \$99. VDOnet Corp., Palo Alto, CA; 415-846-7700; fax, 415-846-7900; www.vdolive.com. Circle 494 on reader service card.



With their roots in networked document conferencing and Internet telephones, Internet-enabled collaboration products will quickly become a standard way to leverage the Internet's ubiquitous connectivity.

Creative Software Technologies Inc.

CollabOrator System 1000

ALL REVIEWS BY JAN OZER

Creative Software Technologies' CollabOrator System 1000 multimedia conferencing product offers the collaboration basics—application sharing, whiteboard, chat, and file transfer—but it falls short on execution. In a market moving toward multipoint conferences, CollabOrator allows only two-party communication. In a 32-bit market, CollabOrator is a 16-bit product with proprietary video drivers that conflicted with one test system. Most importantly, CollabOrator's

modules were only average performers against the product's competitors.

CollabOrator System 1000 is the company's entry-level product. CollabOrator System 9000, which will include audio and video multipoint conferencing over the Internet, won't be available until late this year. CollabOrator 1000 provides no audio capabilities, relegating users to chat conferences or conventional telephone calls.

All major functions run in child windows separate from the main screen. While some CollabOrator applets (such as TrystTransfer) appear on the Windows 95 taskbar, others (such as TrystChat and TrystBoard) do not, which complicates

finding open CollabOrator applets.

CollabOrator refers to you as the "user" if you're the conference's host and as the "individual" if you're using the remote system. Any "user" can enter directory information: first and last names and an optional image that appears in both parties' windows during the conference. To place a call, you choose an entry and press Dial.

A taskbar icon lets you choose to answer calls either manually or automatically, but CollabOrator can't answer if the program isn't running. Accepting a call launches the TrystControl window, which contains the two conferees' names and icons.

WHITEBOARD

TrystBoard, CollabOrator's whiteboard program, feels like a simple image editor, and it proved a competent performer despite a few annoying quirks. The drawing canvas is framed by menus and an icon bar on the top, a toolbar on the left, and a 16-color palette on the bottom. The program opens and saves files in a proprietary .WBD format, but it can import .BMP files and paste most standard data types.

TrystBoard can store everything on the canvas as a single image or keep elements such as text and drawings as separately editable objects. You can paste information into TrystBoard as editable text or as a bitmapped image.

You launch TrystBoard via an icon or menu item, but you still have to log in the

INTERNET COLLABORATIVE TOOLS

How to Read the Suitability to Task Boxes

Multiparty conferencing looks at each product's ability to facilitate general conferencing between more than two persons. The score is based on the number of applications that support multiparty collaboration and the quality of user controls. Can one participant flexibly manage control of shared resources and pass control to another or to the group? Are individual conferees and their entries clearly identified to others in the conference? Are updates automatically visible to all participants? We also looked for acceptable performance over modem links.

Application sharing An application-sharing module should give the host control in sharing an application, but the tools for editing, saving, and exiting a program should be available to all. Annotations should be

SUITABILITY TO TASK		
Product name		
	Power	Ease
Multiparty conferencing	Poor	Poor
Application sharing	Fair	Fair
Whiteboard	Good	Good
Audio conferencing	Excellent	Excellent

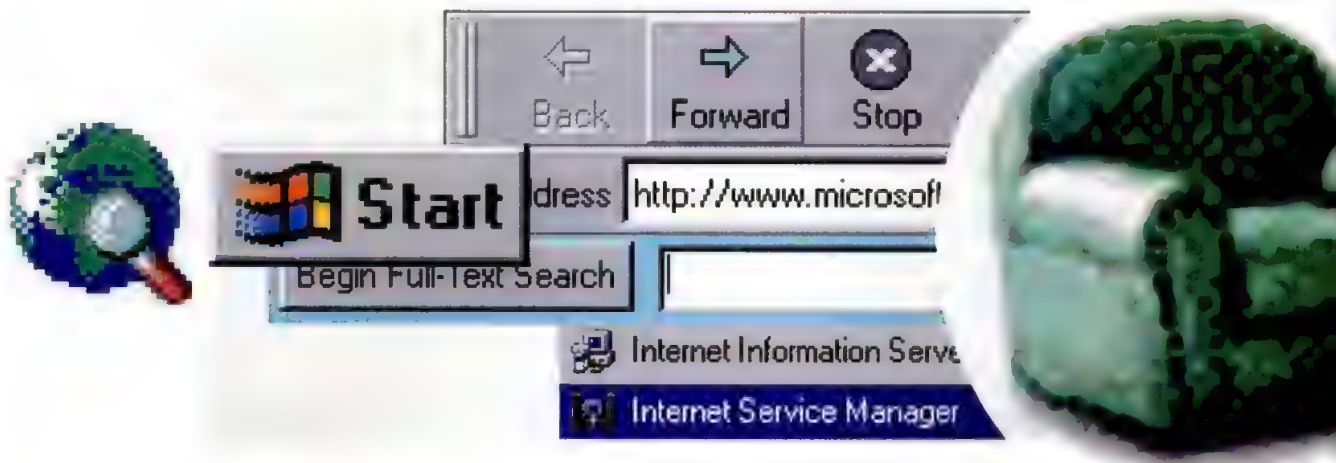
updated on remote users' screens automatically, and color-coded annotations or cursors that identify individual users are a bonus. Program responsiveness should be acceptable even using modem links. The program should let you share any standard application, and the image should not be confined within a fixed application-sharing window. Remote users should have access to multiple page files and not just the viewable page.

Whiteboard The ideal whiteboard utility offers a full complement of drawing and annotation tools, an undo feature, a remote pointer, screen capture, and remote screen synchronization so that all conferees are literally on the same page. It should support multiple screens and be able to import standard data types. It should provide a variety of compression options and deliver reasonable performance across a modem link. We deducted points for distortion of shared images or loss of formatting in text documents or spreadsheets. Color-coding of individual users is a plus, as was the ability to preserve text and images as individual, editable objects.

Audio conferencing We looked for the ability to use Internet voice conferencing between at least two of the participants during a collaboration session.

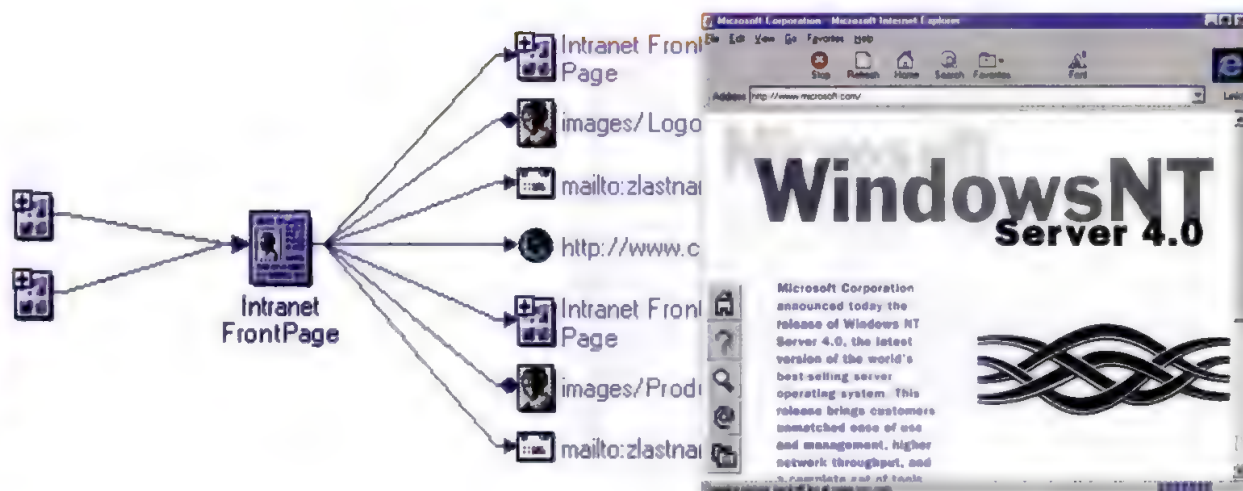
Microsoft Windows NT Server 4.0

lets you build



an intranet

right in the comfort of your own network.



New **Windows NT[®] Server 4.0** extends beyond file, print, application and communication services to offer a complete and integrated **Internet and intranet platform**. You can easily expand your existing network to include the Internet and intranet because **Windows NT Server 4.0** comes with **Microsoft Internet Information Server** and **Microsoft FrontPage** web authoring tool included — and **Microsoft Index Server** is free off the Web.* Innovations like **PPTP**, **MultiLink Remote Access** and **DNS** make it even easier by offering you secure, flexible, high-bandwidth communication across the Internet. And,

of course, **Windows NT Server** supports all standard **Internet protocols** so you're never locked in or left out in the Internet cold. **Windows NT Server 4.0** performance is better too: It offers over twice the network throughput and is 35% more scalable than **Windows NT Server 3.51**. Most importantly, **Windows NT Server** is easy to use. With features like the **Windows[®] 95 interface** and **wizards** that automate common administrative tasks, you can move on to more important things, like lunch. If eating somewhere other than at your desk sounds like something you'd be interested in, take a closer look at **Windows NT Server 4.0** at our Web site.

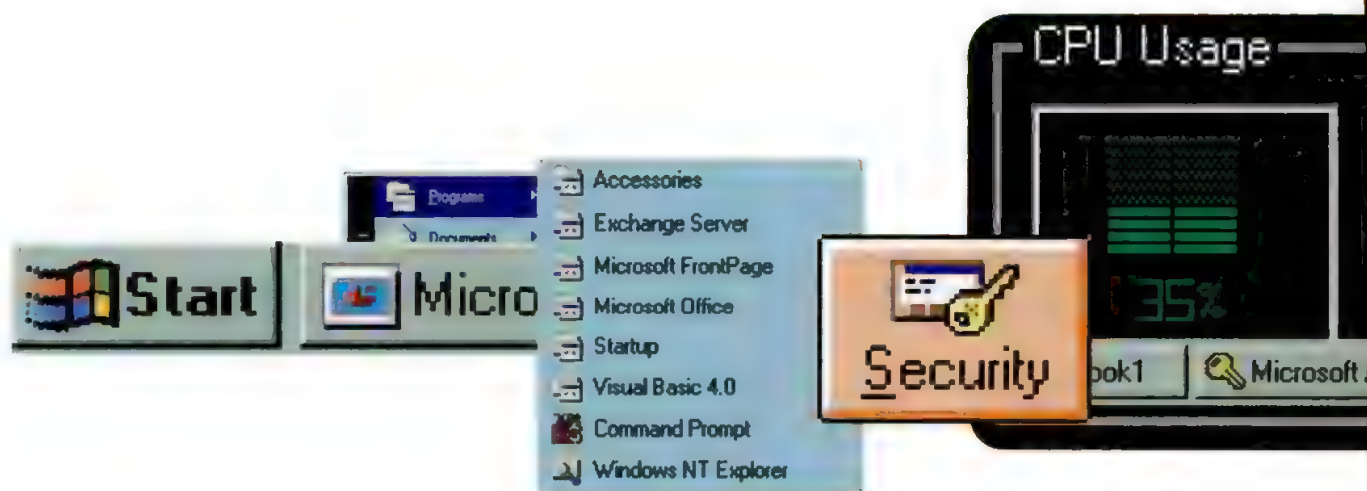
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Microsoft Windows NT Workstation 4.0

has the ease of
It has the power

It has



Windows 95. of Windows NT. computers everywhere drooling.



The new **Windows NT® Workstation 4.0** operating system has been designed to be the most powerful desktop operating system. And because all that power is controlled by the **Windows® 95 interface**, it's much easier to use. The total **32-bit power** of Windows NT Workstation means reliability, security, and easy access to the Internet and **intranet**. It's reliable because all applications run in their own memory space — so that new game beta won't crash last week's work. It's **secure** because integrated features let you **lock your system** all the way down to the file level, so you can count on applications and data being safe.

It's Internet-ready because it's loaded with built-in features like **TCP/IP**, the **Microsoft Internet Explorer** browser, and integrated **Peer Web Services**, which lets you create a small intranet for your workgroup. And because it's all controlled by the Windows 95 interface, you can customize your system to work and look however you like. So does all this mean Windows 95 is history? Absolutely not. Windows 95 may still be your best choice, depending on your existing hardware and applications. We suggest you dive headfirst into our Web site to compare and contrast operating systems to see which 32-bit desktop is best for you.

Microsoft®

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remote "individual" by dragging a TrystBoard Connect Who icon from the icon bar to the person's icon in the TrystControl window. When you connect, the program won't transfer information you entered into TrystBoard before logging in the remote "individual."

TrystBoard supports multiple pages, and conferees can open multiple TrystBoard windows. The program offers a competent set of tools, including a remote pointer, but it provides no screen capture capabilities. It also lacks a screen synchronization tool for putting all conferees on the same whiteboard page. TrystBoard does provide an engaging presentation mode that lets you link several .BMP files into a single presentation. Both parties can flip through and annotate the individual slides.

Although TrystBoard offers two compression options, CollabOrator's image transfer times were among the slowest for the products tested. Once loaded, images appeared identical to the originals.

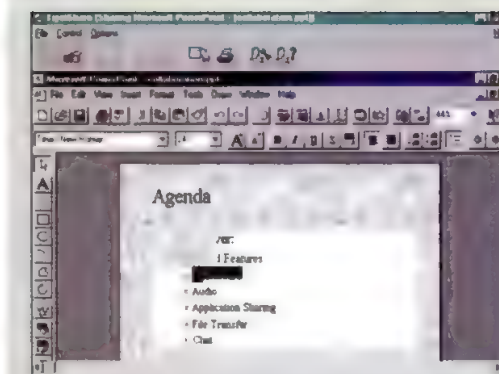
TrystBoard generally worked as advertised, pasting images from Word, Excel, and the MediaStudio image editor without incident. One annoyance was that the program didn't transfer text to the other party until we moved the mouse cursor to another location; pressing Enter wasn't enough. All other annotations appeared on the screen after we lifted the mouse button.

APPLICATION SHARING

TrystShare, CollabOrator's application sharing applet, suffers from an unfinished feel. The application sharing technology requires a proprietary video driver, and it wasn't as stable as the techniques we found in other products. To run TrystShare, you launch the applet via the menu or a toolbar button; then, as with TrystBoard, you register the remote "individual" by dragging the Connect Who icon into the person's icon in TrystControl. You can share any open Windows application or register applications for launching within TrystShare.

Whoever launches and shares the application is the host, able to grant application control but to revoke it at any time, too. A person with application control has complete access to all program functions.

At the remote site, applications run in-



side the TrystShare window, which reduces their viewable size. The host sees the program in its normal window. Because the program saves files only at the host, TrystShare provides the useful option of printing a screenshot of the shared application.

Conflicts between the proprietary video driver required for application sharing and the Number Nine Imagine 128 graphics board on one of our test computers limited TrystShare's utility for some applications. In PowerPoint, the client lost the cursor, and highlighting text caused the letters to break up slightly. CollabOrator did work well with Excel and MediaStudio.

COLLABORATOR EXTRAS

TrystChat, CollabOrator's chat utility, is a primitive split-window application that lacks such basics as the ability to insert prepared messages or save a chat. CollabOrator's file transfer utility, TrystTransfer, is more functional and easy to use than TrystChat, but it lacks batch-transfer capabilities. CollabOrator's file transfer speed ranked in the midrange among the three tested products with file-transfer capabilities.

A groundbreaker when introduced in late 1995, CollabOrator has not aged well in the fast-paced Internet conferencing market. If you're interested in the company's upcoming products with full audio and video, you might want to give CollabOrator 1000 a try as a preview. Otherwise, give it a pass.

CollabOrator System 1000. List price: \$199. Creative Software Technologies Inc., Montgomery Center, VT; 802-326-4215; fax, 802-326-4488; www.cst.com.au. Circle 497 on reader service card.

SUITABILITY TO TASK

CollabOrator System 1000

	Power	Ease
Multiparty conferencing	N/A	N/A
Application sharing	Good	Fair
Whiteboard	Good	Fair
Audio conferencing	N/A	N/A

N/A—Not applicable. The product does not support this feature.

CollabOrator was an average performer with its set of very basic tools for Internet collaboration.

Netscape Communications Corp.

CoolTalk

Everything that CoolTalk sets out to do, it does reasonably well. Problem is, compared with other products, CoolTalk just doesn't do enough. More a full-featured Internet phone than a true collaboration tool, it offers audio, chat, and whiteboard, but it lacks file transfer or application sharing. It also falls behind the curve in being a point-to-point rather than a multipoint tool, and it doesn't support the new ITU collaboration standards. CoolTalk's only unbeatable feature is its price: It's a free option included with Netscape Navigator 3.0, which we evaluated in the beta 5 release.

Once you look beyond the program's sparse interface, you find that CoolTalk has some nice features, particularly as a telephone. CoolTalk's address book has a handy speed-dial feature that places a button on the bottom of the program screen for one-touch calling. If you choose, a watchdog function responds to incoming calls when the main program isn't loaded. Either in watchdog mode or when CoolTalk is running, you can set the program to accept or decline all calls automatically. CoolTalk also has an answering machine that plays a recorded message and stores callers' voice messages.

CoolTalk uses two codecs: a low-bandwidth, speech-only codec (RT24) and a higher-bandwidth, general-purpose codec (GSM). We found the audio produced by the RT24 codec somewhat fuzzy and degraded but decipherable, while the GSM codec's audio was stronger though still slightly fuzzy. With both codecs, the audio was clearly adequate for casual conversations but may be distracting in a business

SOFTWARE TESTING

Internet Collaborative Tools



The unpredictability of Internet bandwidth makes traditional performance testing less relevant for Internet collaboration software than features testing. While we looked at both issues, we concentrated on task-oriented tests that exercised product features.

How We Tested

In testing the products, we focused on three main features: application sharing, whiteboard, and file transfer. In order to test application sharing, we ran Excel, Word, PowerPoint, and MediaStudio on one computer and then attempted to take control of that application from a remote computer. We attempted to use common functions such as simple editing, spell-checking, opening files, and saving.

In order to test whiteboard capabilities, we pasted the output from Microsoft Office's Excel, Word, and PowerPoint and the

image editor from Ulead MediaStudio onto the whiteboard canvas. We also tried drawing with each collaboration package's tools. In order to test the communications protocols and compression techniques that whiteboards use for accelerating data transfer, we timed how long a 250K .BMP file took for the image to appear fully on the other system. Because compression can affect performance, we also noted any changes in the appearance of the image.

For testing file transfer speeds, we timed the transfer of a 100K file between two pairs of 133-MHz Pentium systems, one connected over the Internet via a 28.8-Kbps modem link, and the other through a T1 connection. We tested all systems twice within the same 30-minute period and averaged the two scores.

Our test-bed systems were Micron Millennia Plus Pentium 133 PCs with 16MB of RAM, ATI Mach64 PCI video cards, Sound Blaster AWE32 audio cards, and Andrea ANC 500 telephony headsets. To connect to the Internet, we used Practical Peripherals PM288MT II modems for 28.8-Kbps hookups, as well as connections to our corporate T1 line through our internal 16MB Token-Ring LAN via Proteon 1392 cards.—*Jay Munro and Jan Ozer*

setting. CoolTalk's phone capabilities are discussed in full earlier in this story.

WHITEBOARD: MIXED STRENGTHS

CoolTalk's collection of drawing tools is on the sparse side, but the whiteboard does have a remote pointer, and its screen capture capabilities are the most comprehensive we found in all the reviewed products. It can capture any active window, selectable region, or even the whole desktop. In operation, we found that the program distorted colors in captured 16- and 32-bit screens.

Like most whiteboards, CoolTalk resembles a paint program in design, with menus and icons on the top and a floating toolbar that can frame the editing canvas. The whiteboard has two canvas layers: an image layer that contains images loaded or pasted into the canvas, and a markup layer that holds both drawings you've made over the image layer and all pasted images. This makes it possible to edit and clear such images separately. CoolTalk supports a wide range of image types, including .BMP, .PCX, TIFF, .GIF, and JPEG.

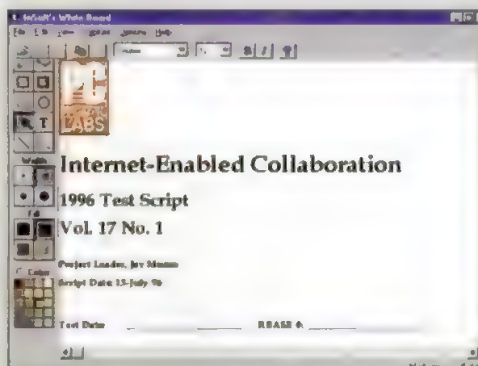
Unfortunately, the program limits you to a single 640-by-480 viewing area for its canvas, and you can use only one page. CoolTalk doesn't save annotations separately, so you can't edit your additions, and

you can't move an image once you've placed it on the canvas. The lack of an undo control means that your editing marks are truly final unless you erase one manually or clear the entire layer. For pasting files from Excel and Word, CoolTalk gives you the choice of pasting either text or bitmap data. Both options cut off all data at the 640-by-480 maximum.

CoolTalk dithers all bitmaps loaded into Whiteboard, so you won't want to use it for transferring images that must retain their quality. Given that it uses both dithering and image compression, CoolTalk's image transfer times were unimpressive: only a few seconds faster than NetMeeting which performs neither of the two functions.

CoolTalk's chat feature is a simple pro-

gram with strengths and flaws. You can add text files typed in other programs into the composition window, which is useful for sending prepared messages, but typed comments don't transfer until you press Ctrl-Enter, a two-keystroke send that some users may find annoying. You can also save chat contents; CoolTalk prompts you to save when you open new chat windows but, oddly, not when you exit the program. Netscape has stated that CoolTalk will be the basis for the conferencing element of LiveMedia, which will implement the RTP standard for carrying real-time, streaming multimedia over the Internet. Whether this enhances suitability for Internet-based collaboration remains to be seen. What's clear today, however, is that while CoolTalk's whiteboard has some nice features, it is sur-



SUITABILITY TO TASK		
CoolTalk		
	Power	Ease
Multiparty conferencing	N/A	N/A
Application sharing	N/A	N/A
Whiteboard	Fair	Good
Audio conferencing	Good	Good
N/A = Not applicable. The product does not support this feature.		

CoolTalk's whiteboard performs well, but its lack of application sharing makes it a glorified Internet phone.

SUMMARY OF FEATURES

Internet Collaborative Tools

PC MAGAZINE
EDITOR'S CHOICE

■ YES ■ NO	CollabOrator System 1000	CoolTalk	Internet Conference Professional	Microsoft NetMeeting
Products listed in alphabetical order				
General Features				
List price	\$199.00	Free (as part of Netscape Navigator 3.0)	\$49.95	Free
Native support for Windows 3.x/95/NT	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Full documentation via help/Internet	■ ■	■ ■	■ ■	■ ■
Support via e-mail/Web	■ ■	■ ■	■ ■	■ ■
Toll-free support	■	■	■	■
Multipoint data-conferencing capability	■	■	■	■
Multipoint audio-conferencing capability	■	■	■	■
Can search global/online users	■ ■	■ ■	■ ■	■ ■
Personal address book	■	■	■	■
Connection timer	■	■	■	■
Off-line call notification	■	■	■	■
Internet/modem/network connection	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Minimum recommended connection speed	14,400 bps	9,600 bps	14,400 bps	14,400 bps
Audio Conferencing Features				
Variable sampling rates	N/A	■	N/A	■
Audio tuning wizard	N/A	■	N/A	■
Microphone/speaker volume control	N/A	■ ■	N/A	■ ■
Automatic gain control	N/A	■	N/A	■
Can record	N/A	■	N/A	■
Visual feedback on voice levels	N/A	■	N/A	■
Connection statistics	N/A	■	N/A	■
Voice mail	N/A	■	N/A	■
Call blocking	N/A	■	N/A	■
Whiteboard Features				
User can edit text and images separately	■	■	■	■
Screen capture/Multiple pages	■ ■	■ ■	■ ■	■ ■
Integrated tools:				
Text	■	■	■	■
Pen	■	■	■	■
Highlight	■	■	■	■
Brush	■	■	■	■
Spray	■	■	■	■
Selective writing privileges	■	■	■	■
Auto-synchronized data	■	■	■	■
Remote pointer	■	■	■	■
Prompts for save	■	■	■	■
Variable compression settings	■	■	■	■
Application Sharing				
One user/any user can control application	■ ■	N/A	■ ■	■ ■
Remote users can view/edit a file without having the source application locally	■ ■	N/A	■ ■	■ ■
Name/color identifies user entries	■ ■	N/A	■ ■	■ ■
Online editing	■	N/A	■	■
Chat features				
Chat facility	■	■	■	■
User can save chat	■	■	■	■
User can enter existing text file	■	■	■	■
User can paste existing text	■	■	■	■
File Transfer				
Drag-and-drop functionality	■	N/A	■	■
Can transfer files to selected users	■	N/A	■	■
User can refuse transferred files	■	N/A	■	■
Compression	■	N/A	■	■

N/A—Not applicable. The product does not have this type of feature.

prisingly unambitious in terms of collaborative use. Those seeking more than an Internet telephone and answering machine should look elsewhere.

CoolTalk. Price: Free with Netscape Navigator 3.0. Netscape Communications Corp., Mountain View, CA; 415-937-2555; fax, 415-528-4124; www.netscape.com. Circle 482 on reader service card.

VocalTec Inc.

Internet Conference Professional

VocalTec's \$149.95 Internet Conference Professional (ICP), Version 1.2, is a mature conferencing solution whose many outstanding features are undermined by its lack of integrated audio conferencing, its awkward application sharing, and its initially steep learning curve. ICP provides whiteboard, chat, file transfer, and application sharing via OLE. It does not offer Internet telephone functionality, but it supports VocalTec's well-known Internet Phone. VocalTec says that ICP's next update, due by the time this story appears, will remedy its current deficiencies.

NIKING UP THE LEARNING CURVE

ICP is one of those programs that make you mutter, "Why is this so hard?" But a few simple concepts unlock its enigmatic interface. The whiteboard canvas is called a *Frame*, and you can open multiple Frames during a session. To share a newly opened Frame with other conferees, you make it active via menu or keystroke commands. Whoever calls the conference is the *Master* and decides which Frame will be active for all conferees. That person can allow or forbid others to make their Frames active or can require them to ask for permission each time. With these rules behind you, ICP is a breeze to work with—at least until you get to application sharing.

ICP facilitates the conference environment with an address book that can dial multiple recipients. Alternatively, you can connect with another conferee by logging into one of the Internet IRC servers that support ICP. Surprisingly, ICP has to be running in order to accept conference invitations.

ICP's main stage is the whiteboard, from which the program makes all con-

nections and launches all other activities. As with most whiteboards, menus and icons are on top, and a drawing toolbar is on the left. In addition, the right-mouse-click opens up the entire menu structure, a nice convenience. Most of ICP's menu commands have keystroke analogs, which speed operation for experienced users.

With ICP loaded, you can opt to accept or reject all conference invitations or to decide on each one individually. The conference starts once you accept the invitation; at that point, all participants see the same whiteboard screen.

WHITEBOARDING IN INTERNET SURF

ICP's whiteboard tools are about average, but the program's conference-enhancing capabilities, such as the color-coding of participants and the ability to save an entire conference, give it a slight edge. The whiteboard loads and saves frames in proprietary .CFR files but also inputs JPEG files. The program keeps images separate from annotations, so you can clear annotations without deleting an image. You can't edit annotations, however.

ICP helps conferees keep track of annotations by recommending that each person choose a unique editing color, and by listing the conferees' names on the bottom of the screen in their chosen colors. ICP also features two screen-capture facilities and a remote screen synchronization tool. Drawing implements include pen, highlighter, text tool, eraser, and tools for creating lines, rectangles, ellipses, and diamonds.

Pasting images into ICP is an adventure, because the program assumes that pasted files are linked objects rather than pasted bitmaps. If you inadvertently double-click on a pasted image, you launch the application that created it.

ICP had no problem pasting files from Microsoft Excel and the MediaStudio image editor, but it could paste only a page at a time from Word. In transferring data pasted into the clipboard to remote parties, its speed fell in the midrange of products we tested.

APPLICATION SHARING

ICP provides some measure of application sharing using OLE, but the method is far from intuitive, and the help documen-

tation is extremely skimpy. Only the excellent description on VocalTec's home page allowed us to grasp the scheme.

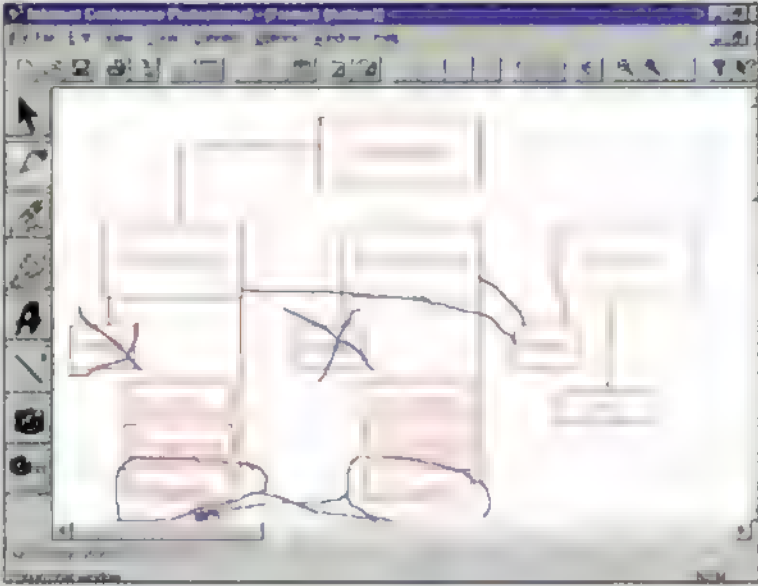
Here's how it works. ICP is an OLE 2.0 client capable of running OLE server applications from within its whiteboard. You start application sharing by cutting and pasting a file into ICP from an OLE server application or by using ICP's insert-object menu command.

Once you insert the object into an active window, all conferees can view the file but not yet edit it. Any conferee who has the

window. The chat application provides a small window on the bottom for text entry and a larger, scrollable window on top displaying the entire chat with the authors' names to the left of their comments.

File transfers were the fastest we saw because of ICP's optional compression. ICP also lets you send files only to selected users, another valuable feature in a group environment.

You may begin appreciating some of ICP's subtler features after prolonged exposure, but unless Version 2.0 substan-



SUITABILITY TO TASK		
Internet Conference Professional		
	Power	Ease
Multiparty conferencing	Good	Good
Application sharing	Fair	Fair
Whiteboard	Good	Fair
Audio conferencing	N/A	N/A

N/A—Not applicable. The product does not support this feature.

ICP had the best whiteboard for conferencing, but it has a steep learning curve and problematic application sharing

application loaded should then be able to double-click on the document that loads it, to enable editing. But only one conferee at a time can edit, and the others can't watch the editing, because the program doesn't update remote conferees' screens until the editor exits the OLE server application.

Application sharing worked well with Excel, but WordPad, MediaStudio, and Word Pro wouldn't load inside a frame and couldn't be seen by remote parties. PowerPoint loaded in a viewable frame when embedded, but because only one page embedded at a time, a 16-page presentation took 16 separate frames plus 16 cuts and pastes. Only the first page of Word documents was present after pasting or inserting, and Word crashed regularly in our testing. For ICP 2.0 (in alpha testing at this writing), VocalTec has slated the inclusion of application-specific support for Microsoft Office. This may provide smoother application sharing with Microsoft Office programs.

ICP's chat feature provides the basics but little else. You can type or paste comments into the data entry window, but you can't open a document into it, though you can save and later reload an entire conference, including open frames and the chat

tially improves its application sharing and delivers the promised integrated audio, most users will remain better off with less expensive products.

Internet Conference Professional. List price: \$149.95. VocalTec Inc., Northvale, NJ; 201-768-9400; fax, 201-768-8893; www.vocaltec.com. Circle 486 on reader service card.

Microsoft Corp.

Microsoft NetMeeting



The only reviewed product with both application sharing and integrated voice capabilities, Microsoft NetMeeting is a well-designed, easy-to-use package that also includes whiteboard, chat, and file transfer features. The more bandwidth you have, the better NetMeeting works, but if you don't use the voice functions, everything else works adequately at speeds as low as 14.4 Kbps. NetMeeting is available from Microsoft's Web site free of charge.

Significantly, NetMeeting is the first collaboration product to support the International Telecommunications Union

Internet Collaborative Tools

(ITU) T.120 standard for multiuser data conferencing. Support for this standard, which incorporates audio, whiteboard, and still-image and binary-file transfers, should ensure interoperability with programs from some 20 other companies that also support it.

SHARE AND SHARE ALIKE

NetMeeting's crown jewel is its application sharing feature, which lets all conferees view and optionally control applications on a remote computer. As the host, you click on the Share icon and select an application to share. This sends the application's screen image to all participants; remote users have access to the program's tools and any documents you open.

When launching a sharing session, NetMeeting defaults to work-alone mode, which lets conferees view but not control the program. Once the host selects collaborate mode, any conferee can take control of the application simply by clicking on the program's image. Then the remote conferee can use any function of the program, including save, delete, and exit. NetMeeting shows who's controlling the application by placing the user's initials next to the moving cursor.

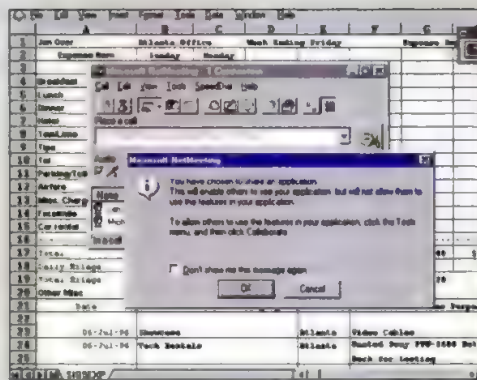
We found that program responsiveness depended upon application type and connection speed. It took about 15 seconds to share an Excel spreadsheet between computers connected at 28.8 Kbps. Scrolling through the file was sluggish but not unacceptably so. Image editing using MediaStream at 28.8 Kbps was painfully slow, but displaying a series of Microsoft PowerPoint slides across a T1 connection was almost as fast as working locally. Overall, NetMeeting proved serviceable at all tested connection speeds for text-based applications such as Windows word processors or spreadsheets.

WHITEBOARD

Whiteboard, a standalone application that resembles Microsoft Paint, includes only a modest assortment of editing tools but provides advanced functions such as a remote pointer, read-only settings, and screen capture. You launch it through an icon or menu command, which triggers the application on all conferees' computers. Whiteboard maintains all pasted and manually entered annotations as sepa-

ately editable objects rather than merging them into a flat image.

Whiteboard supports multiple pages and has a synchronization option that keeps all conferees on the same page. The program transmits to each conferee any bitmaps pasted into a whiteboard. Because Microsoft doesn't compress or color-reduce image data, synchronization can be time-consuming on low-bandwidth lines. When one conferee exits Whiteboard, all others retain the contents until they exit, preventing inadver-



tent deletion.

The program captures as bitmaps any files pasted into the whiteboard, even if they come from a text-based application such as a word processor. NetMeeting retained the proper formatting when we pasted from Excel, Word, or our MediaStudio image editor. Even without an image compression option, image transfer times were among the fastest we saw.

TALK ALONG WITH NETMEETING

Only two conferees can have a voice connection during any conference, and other participants do not hear the conversation. This makes NetMeeting's text-based Chat essential for group conferences (assuming that external telephone connections are not available or desirable). As participants join the conference, NetMeeting lists them in a program window, identifying which two have voice capabilities and describing their application-sharing status.

While audio quality at high bandwidth was acceptable, voice conversations were less natural than normal phone calls. When working with two full-duplex sound systems, we experienced a few audio gaps that forced us to repeat our-

selves. Such gaps occurred frequently with half-duplex systems, lending the conversation a ham radio-like feel. We fully discuss NetMeeting's phone capabilities in our Internet phone roundup earlier in this story.

CHAT AND FILE TRANSFER

As with Whiteboard, NetMeeting activates its chat utility on all systems when any conferee initiates a chat session. The interface has two panes: a large, scrollable window on top that tracks the conversa-

SUITABILITY TO TASK

Microsoft NetMeeting

	Power	Ease
Multiparty conferencing	Excellent	Excellent
Application sharing	Excellent	Excellent
Whiteboard	Good	Good
Audio conferencing	Good	Good

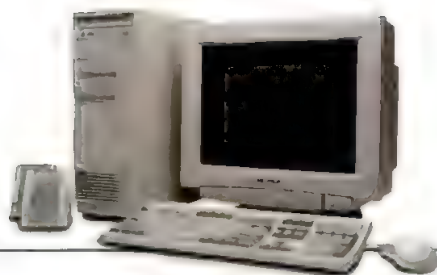
NetMeeting combines a complete suite of collaboration tools with good performance to create an unbeatable package.

tion, and a smaller window on the bottom for entering text. The program doesn't send messages until you press Enter, so you can edit your comments before sending them off. While you can't import a text file directly, you can paste in text from another application. Any participant can save the conversation as a comma-delimited file, and the program prompts all users to save on exiting.

File transfer was serviceable but lacking in some features. In the beta we tested, you can't send a file to select recipients but must send it to all conferees. You can't refuse a file that you receive. Finally, while you can queue multiple files for sequential transmission, you have to close a dialog box after sending each file, thereby interrupting the batch process.

Overall, NetMeeting proved extremely functional as well as very stable during all of our tests. With its well-designed modules and support for ITU standards, NetMeeting can change the way remote groups work together. □

Microsoft NetMeeting. Price: Free. Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080; fax, 206-635-1049; www.microsoft.com. Circle 487 on reader service card.



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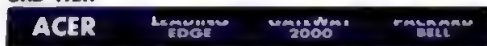
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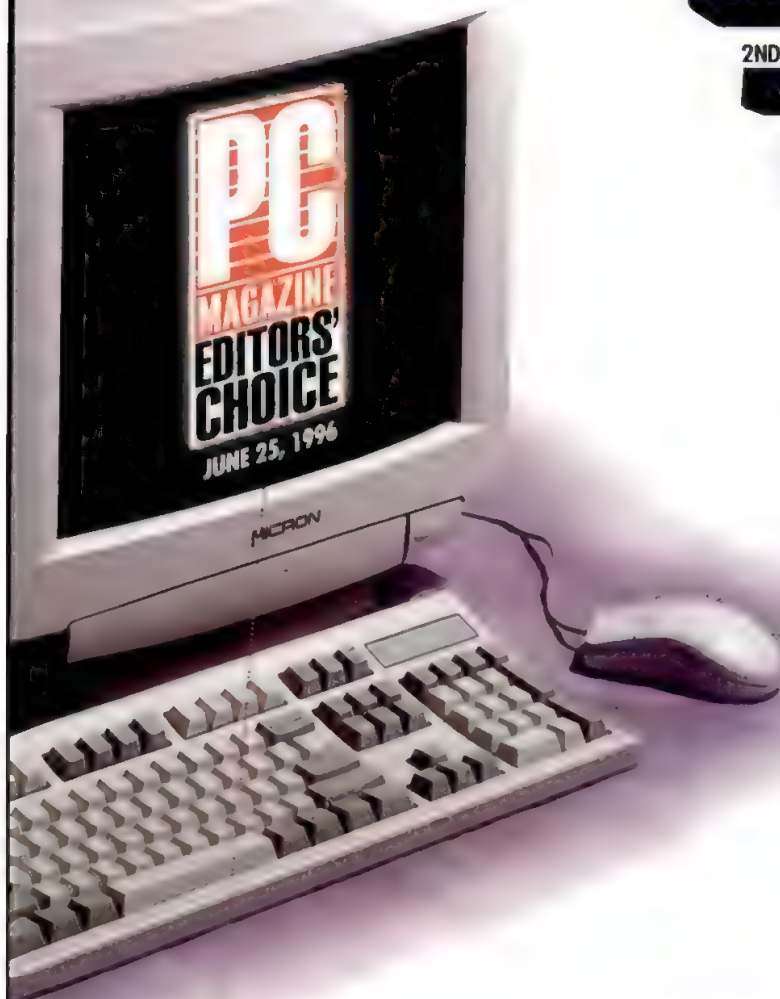
2ND TIER



3RD TIER



Source: PC World Reliability & Service Monitor, May 20 - November 20, 1995

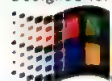


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NEWSGROUP READERS: *Framing* THE DISCUSSION

IF THE WORLD WIDE Web often seems like a place of barely contained anarchy, newsgroups strike many as the anarchists' coffeehouse. It's the other side of the Internet, where *alt.u-name-it* rules. Newsgroups exist for carrying on threaded discussions on subjects as wide-ranging as American politics, Pamela Anderson Lee, and Java programming.

Newsgroups—which appeared long before the advent of the Web, as far back as the early 1980s—originally stemmed from the need researchers had to exchange ideas efficiently with a large audience. Today there are approximately 15,000 newsgroups; new

The Internet's
subculture has risen to the
surface and is becoming
a respected part of
Internet discourse.

By Sean González

ones appear every day.

At their best, they give you access to a wealth of information on work, research, and leisure. And because the news application architecture supports binary data types, newsgroups are not limited to text-based discussions; they also function as a source of binary data, called *binary attachments*.

But at their worst, because newsgroups lack any content control or even ratings, they often contain information that you might find objectionable. Rudimentary article filtering, which exists in some of the products covered here, helps separate the wheat from the chaff. But as newsgroup veterans will tell you, news reading

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Join Us Online for a discussion of the newsgroup reader industry from September 20 to October 4. Also visit www.internetuser.com for other useful links.

WWW.PCMAG.COM

GLOSSARY

These Terms Are News to You

Bozo list A list of individuals who routinely post useless or offensive information in newsgroups. It enables users to ignore such postings.

Cross-posting Posting the same message to multiple, related newsgroups.

FTP (File Transfer Protocol) A standard that allows users to transfer files between systems over the Internet.

Kill filters and watch filters User-defined rules for screening out unwanted articles. They force the news

reader to take a specific action on articles that meet certain criteria.

Multipart binary attachment A binary file attachment distributed in several parts. MIME is one coding scheme that supports such attachments.

Newsgroup A collection of news articles organized by topic and visually through hierarchical groups.

Newsgroup subscription list Metaphorically, a locally organized list of the newsgroups that you read and post to most often.

News reader Software that lets the user connect to a news server to retrieve news articles. It usually runs on a desktop computer.

News server A machine running Network News Transfer Protocol (NNTP) software, which allows the system to transmit newsgroup names, the number of new articles in each newsgroup, and the news articles themselves.

Spam A useless or offensive message broadcast to multiple newsgroups. Some advanced news readers can screen out this type of message.

is not something you'd want to let your children do alone.

Every day the Internet transmits approximately 1 gigabyte's worth of news articles worldwide. To keep track of so much information, the hierarchically named newsgroups store these articles. Newsgroup names describe the information within them.

Newsgroup readers (or news readers)—the software tools you use to read newsgroup articles and post your own contributions to the discussion—usually have search capabilities that help you locate newsgroups that interest you, making it easier to subscribe to them. Subscriptions are simply active links to your favorite newsgroups. The news reader keeps a list of them, enabling it to track the day-to-day activity of each newsgroup.

A great deal of the information con-

tained in newsgroups is binary data in the form of images and programs. These binary files must be encoded in text format. The two most common encoding formats are called *uuencode* and *Base 64*.

Because binary attachments can be so large, they're often split into small parts, and you have to join the parts to decode them. Some of the news readers we evaluated automatically locate, join, and decode all parts of a binary attachment.

Because of the wealth of articles and data in newsgroups, you'll need a way of filtering out material that doesn't interest you or seems unsuitable for your children. Some of the more advanced news readers offer kill and watch filters, bozo lists, and spam protection to help you do so (see the glossary for definitions).

But not all in the world of newsgroups is dark and foreboding, or necessitates

parental supervision. In fact, these tools may represent the next step in threaded discussion for large, spread-out organizations connected via an intranet, or even for disparate groups that want to reach a consensus—without renting a convention hall.

Forté Inc.

Agent .99e

ALL REVIEWS BY SEAN GONZÁLEZ

Forté's Agent .99e (\$29 list) is the commercial version of Free Agent 1.0. It offers a multilingual spell-checker, SMTP and POP3 e-mail functionality for sending and receiving messages, user-defined folders, kill and watch filters, a utility for importing e-mail messages from Pegasus and Eudora, and other features expected from a complete news reader.

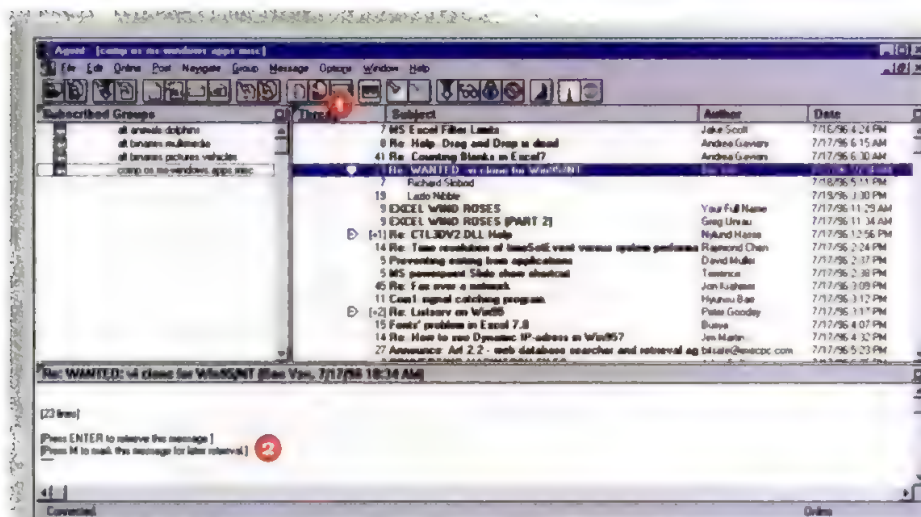
Agent's installation and setup leave

SUITABILITY TO TASK

Agent .99e

	Power	Ease
Installation and setup	Poor	Poor
Message threading and management	Good	Good
Attachments	Good	Excellent
Posting	Good	Excellent

- 1 Agent's toolbar would benefit from more varied icons, but the interface gives you quick access to the program's most useful features.
- 2 Unfortunately, Agent makes you press Enter to view an article.



much to be desired, though. The product doesn't have an automated installation utility; a README file describes the process, which amounts to extracting the compressed files into a directory. The first time you run Agent, you enter your news and SMTP server addresses, your e-mail address, and your full name. You can change configuration options after you have installed the product.

Agent supposedly imports your newsgroup subscriptions as well as the full listing of newsgroups from Netscape, News Xpress, Trumpet News, and WinVN installations. But we were unable to test this feature successfully using Netscape's News files, a bug that Forté acknowledges as an import problem. (A patch that corrects this problem is in the works.)

Setting up your newsgroup subscriptions from scratch is tedious. You can use the Find and Find Next functions to search for newsgroups, or you can scroll down the list to locate the ones you want.

Locating all of Agent's features can be difficult, since some configuration panels are buried several levels deep in the interface. The main interface uses a standard format: one section for newsgroup listings, one for threads and message subjects, and one for message bodies. Although Agent isn't especially intuitive, clicking on title bars does display the information you need. Clicking on the title bar for newsgroup listings, for example, cycles you through All Groups, Subscribed Groups, New Groups, and Folders.

The Folders feature stores read messages, though Agent doesn't support nested folders. Decoding binary attachments is easy, as is deleting decoded attachments. But Agent sometimes lost track of attachments that we downloaded multiple times.

For Version 1.0, expected later this year, Forté plans MIME support, cross-posting management, URL launching, MAPI support (a configuration file for news packages, containing information such as a subscription list), file import/export facilities, and message filtering. The current version locates a URL in a message automatically and copies it to the Windows clipboard.

Our Contributors: SEAN GONZÁLEZ is a freelance writer. DAN SMITH is an associate project leader at *PC Magazine*, and LANCE N. ULANOFF was the senior associate editor in charge of this story.

Windows 95 or Windows NT:

Gravity 1.0

Windows 3.1:

Internet In A Box 2.0 (Spry News)

News reading is a deceptively simple task that would seem to require no more than access to a fast news server and a couple of newsgroup and article windows.

Truth is, good news reading means strong organizational tools, intelligent attachment handling, and strong filters to help you separate the useful articles from the useless ones. Our Editors' Choice, MicroPlanet's Gravity 1.0, satisfies on all counts. But since it runs under Windows 95 and NT only, Windows 3.1 users should look to our other Editors' Choice, Spry News, part of CompuServe's Internet In A Box 2.0.

Gravity was the most automated reader we evaluated. Its powerful Image Gallery binary file attachment manager eases the complex task of downloading files posted in newsgroups. In addition, Gravity performed well under pressure, letting us download messages in the background while continuing other work in the foreground. And when you've finished downloading a group, Gravity can search across message headers or complete message threads. When MicroPlanet adds support for 7-bit encoding, it may very well end up with the per-

fect newsreader on its hands.

Spry News is an effective newsreader with exceptional encoding and decoding tools. What it currently lacks is 32-bit support and filtering capabilities. For Windows 3.1 users, however, it's still the best standalone tool available today.

Honorable mention goes to the news-reading tools that come with the two most widely used browsers on the planet: Netscape Navigator and Microsoft Internet Explorer. Both are good choices for taking part in standard newsgroup discussion and file browsing.

In fact, unless you're itching for more advanced article handling, such as the ability to use rules and filters, there's little reason to buy a standalone newsreader. Of the two products, Netscape's news tool is better integrated, although Internet Explorer's news reader offers better functionality. On the other hand, neither browser is really equipped to deal with the large multipart binary attachments often found in newsgroups.

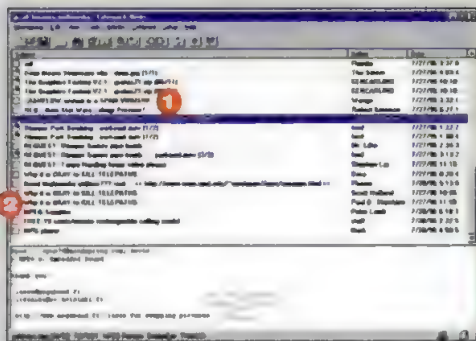


Delrina Corp.

Delrina Cyberjack

Delrina Cyberjack 7.0 (\$79.95), an easy-to-use news reader, offers all the tools you'll need to read news and effortlessly handle binary attachments. But if you're looking for advanced news-reading enhancements such as filters, MIME encoding, and security features, you should look elsewhere.

Cyberjack's installation and setup utility is intelligent and intuitive; the wizard interface covers all the bases to get you up and running quickly and without problems. Obtaining the latest patches and up-



SUITABILITY TO TASK		
Delrina Cyberjack		
	Power	Ease
Installation and setup	Excellent	Excellent
Message threading and management	Fair	Good
Attachments	Excellent	Excellent
Posting	Good	Good

1 Cyberjack highlights articles with attachments by displaying them with a small paper clip 2 Original postings are white and follow-ups are gray.

grades over the Internet is as simple as selecting an option from the main menu bar. And it's easy to locate newsgroups that interest you: You can enter a keyword to narrow the list.

FOLLOW THE THREAD, JACK

Cyberjack displays message threads in a detached window that remains above the other windows. The displayed thread relates only to the highlighted message.

To switch to a different newsgroup, you must open its file from the news interface. It's more efficient, though, to close that interface and use Cyberjack's other interface, called the Guidebook, a series of bookmarks that let you launch and organize news by type.

To decode a multipart binary attachment, you right-click on any message part, and Cyberjack locates and decodes all the parts. You can also select all messages in a newsgroup for decoding, but this action marks them all as read, even if

they contain no attachments. You can browse and delete decoded attachments by activating a Download Log window, which is easier than using the Windows 95 Explorer to manage attachments. Cyberjack even scans decoded attachments for viruses.

You can sort and filter messages, and one filter option allows you to hide read messages. But Cyberjack does not support kill and watch filters, however. The product implements intelligent URL launching quite well: Just right-click on any URL and Cyberjack displays options appropriate to its type. Unlike Emissary Desktop, Cyberjack is a suite of products that launches its Internet applications—e-mail, FTP, browser, IRC, and image viewer—as needed to view different URL types. And you can configure Cyberjack to use Netscape or Internet Explorer if it detects the presence of either on your system.

For accessing newsgroups, Cyberjack

works like a breeze. Its many wizards and intelligent controls will have you navigating newsgroups in no time.

Delrina Cyberjack 7.0. List price: \$79.95. Requires: 486-based PC or better, 8MB RAM, 24MB hard disk space, Microsoft Windows 95 or Windows NT. Delrina Corp., Toronto, Ontario, Canada; 800-268-6082; www.cyberjack.com. Circle 501 on reader service card.

Attachmate Corp.

Emissary Desktop

Attachmate Corp.'s \$99 Emissary Desktop 2.0 incorporates Web, e-mail, FTP and local file manager, telnet, and news clients into one uniform interface. The news interface allows you to configure advanced options, but it's a bit busy and cluttered, which makes it difficult to read news articles.

The installation and setup program is easy to follow. It asks you all the basic questions and, as you use its various modules and more advanced features, it prompts you for the information it needs.

Although Emissary is easy to use, the integration of several Internet tools on one screen results in limited space with which to display news articles. You can adjust the window areas, but Emissary still contains too much information on a single screen to permit easy news browsing.

To work around this, Emissary switches window context depending on the action you take. While this approach attempts to

NEWSGROUP READERS

How to Read the Suitability to Task Boxes

Installation and setup We look at a product's installation process, if there is one, as well as installation wizards for setting up connections to an NNTP server. We also look for other things, such as support for user names and passwords, import configuration information from installed browsers and news readers, and the ability to connect automatically when the news reader is loaded

Message threading and management We look for the capability to read articles from a newsgroup without subscribing to it; to notify you about new newsgroups; to sort articles by date, author, and subject; and to mark articles when read. We also

SUITABILITY TO TASK		
Product name		
	Power	Ease
Installation and setup	Poor	Poor
Message threading and management	Fair	Fair
Attachments	Good	Good
Posting	Excellent	Excellent

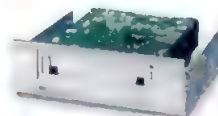
look at the ability to recognize threads and visually display them in a clear and organized manner, as well as how the product handles threads as a single message entity when deleting, downloading, or skipping them. Last, we look at a product's ability

to search through headers and the body of an article

Attachments We examine a product's ability to encode and decode files, auto-partition encoded files over 100K in size into more than one message, find all parts of a decoded file if it's split into multiple parts, and launch or execute decoded files

Posting We examine a product's ability to spell-check a posting and to quote the original posting. We also look at whether the out-box is capable of holding a posting to be sent until you are connected, and whether a signature file can be created.

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If you were to take stock of all the information stored on your PC, you'd soon realize how vital it is to your business. What if one day all that information vanished? Accidents happen. Theft, fire, floods, computer failure or human error can result in a devastating loss of data. The cost of rebuilding



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SUMMARY OF FEATURES

Newsgroup Readers

	Agent .99e	Delrina Cyberjack 7.0	Emissary Desktop 2.0	Gravity 1.0	Internet Chameleon 5.0	Internet in A Box 2.0	Microsoft Internet News	Netscape Navigator Gold 3.0	OUI 1.5
■ YES ■ NO									
Products listed in alphabetical order									
16-bit support	■	■	■	■	■	■	■	■	■
Password child-protection lockout	■	■	■	■	■	■	■	■	■
Connectivity options:									
Multiserver support	■	■	■	■	■	■	■	■	■
Nonstandard NNTP port support	■	■	■	■	■	■	■	■	■
Direct dial-up networking support	■	■	■	■	■	■	■	■	■
Internal encoding/decoding support:									
Uuencoding	■	■	■	■	■	■	■	■	■
MIME	■	■	■	■	■	■	■	■	■
ROT13	■	■	■	■	■	■	■	■	■
Can expand and collapse message threads	■	■	■	■	■	■	■	■	■
Can display in raw (nonthreaded) format	■	■	■	■	■	■	■	■	■
Can launch URLs	■	■	■	■	■	■	■	■	■
Kill/watch rules	■	■	■	■	■	■	■	■	■
Cross-post management support	■	■	■	■	■	■	■	■	■
Marks articles for off-line viewing	■	■	■	■	■	■	■	■	■
Cancels posting	■	■	■	■	■	■	■	■	■

* The product uses Windows 95 capabilities to implement this feature.

make efficient and intelligent use of the available screen space and windows, changing context often can be confusing.

To help you keep your newsgroups organized, Emissary supports folders and nested folders; it also lets you drag and drop newsgroups between folders. Message threading is also supported, and you can easily expand or collapse threads. To view a message or a thread, double-click on it and the article window is displayed.

Opening a message that contains an attachment automatically locates all message parts and identifies the attachment—if it's an image, it's displayed as part of the message body. To extract the attachment, just press the appropriate button.

URL support is implemented quite well. Attachmate designed Emissary to

be an all-encompassing Internet tool, and its integrated interface lets you switch almost seamlessly between various types of Internet resources. Unlike Cyberjack, for example, Emissary is an Internet applications suite that tightly weaves Web, news, FTP and telnet together in a single interface. Think of Emissary as a Web browser with built-in support for news, FTP, and telnet rather than one that leaves those functions to separate helper apps.

Though Emissary works under Windows 95, it doesn't include good threading support. In particular, our test systems locked up while attempting to perform large article retrievals. Once we finished downloading, we were able to resume without any problems. That bug aside, if you are looking for a single

product that integrates news, FTP, Web, telnet, and Internet resources via URLs, Emissary fits the bill. Only the busy interface takes a bit of getting used to before you can fully appreciate its benefits and potential.

Emissary Desktop 2.0. List price: \$99. Requires: 486-based PC or better, 8MB RAM, 4MB hard disk space, Microsoft Windows 3.1 or later. Attachmate Corp., Bellevue, WA; 800-426-6283, 206-644-4010; fax, 206-649-6662; www.attachmate.com. Circle 502 on reader service card.

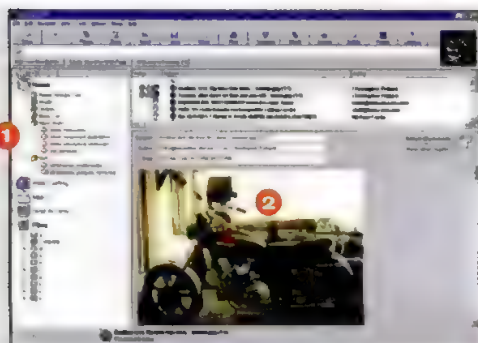
MicroPlanet Inc.

Gravity



MicroPlanet's Gravity 1.0 (\$44.95) is the best implementation of a news reader available today for your Windows 95 PC. By starting with a strong feature set and adding powerful automated newsgroup management, MicroPlanet has created a first-class news reader.

Installation is simple, yet efficient. You need only provide a destination directory, and the installation utility does the rest. When you connect for the first time, you provide the necessary information to access your news server and retrieve the newsgroups listing. Gravity then allows



SUITABILITY TO TASK

Emissary Desktop

	Power	Ease
Installation and setup	Good	Good
Message threading and management	Good	Good
Attachments	Good	Fair
Posting	Good	Fair

- 1 Emissary's interface is a bit cluttered, but its folders help you keep your newsgroups organized.
- 2 Emissary lets you view images inline.

Dear **former**
computer company,

here is a list of my **demands:**

1. i want to buy
high performance
direct and
i want it **fast!**
2. i want a company that has
important
friends who
back them up.
3. when i call, i want to
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who knows my name.

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it's just the way
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- 15" (13.7" viewable) display
- Microsoft® Windows® 95
- Corel® WordPerfect® Suite 7 and Z-MPC bundle*

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- 16MB EDO DRAM
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- 8X CD-ROM
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- Real-time video capture & MPEG1 playback
- 33.6 kbps FAX modem with Simultaneous Voice over Data
- 16-bit SRS® 3D wavetable audio
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- Corel® WordPerfect® Suite 7 and Z-MPC bundle*

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corporate



option #1

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- 256K pipeline burst cache
- Intel 430MX PCiset
- Intel PIII X PCI - IDE Xcellerator®
- 16MB EDO DRAM
- 1.6GB EIDE Hard Drive
- 8X CD-ROM
- 64-bit video with 2MB SGRAM
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- Plug N-Play flash BIOS
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- Microsoft® Office Professional
- Three Year Limited Warranty

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- Intel 430MX PCiset
- Intel PIII X PCI - IDE Xcellerator®
- 32MB EDO DRAM
- 2.5GB EIDE Hard Drive
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- 128-bit video with 2MB MDRAM
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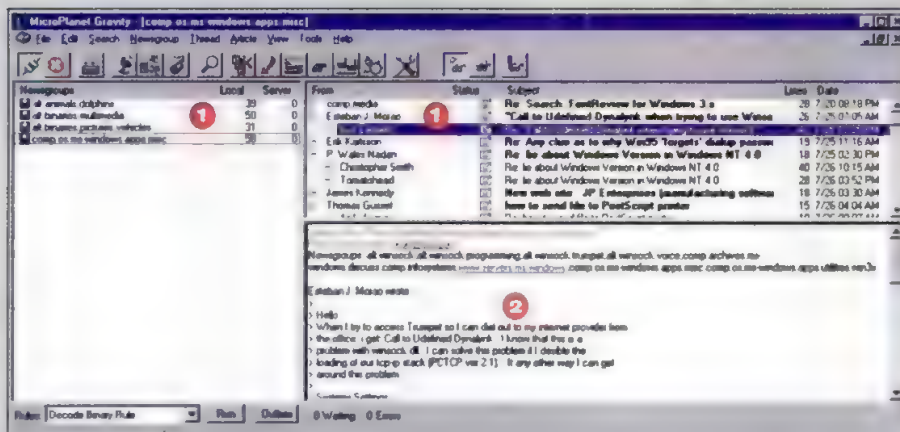
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COVER STORY

Newsgroup Readers



SUITABILITY TO TASK

Gravity

	Power	Ease
Installation and setup	Good	Excellent
Message threading and management	Excellent	Excellent
Attachments	Excellent	Excellent
Posting	Good	Excellent

- 1 Gravity gives you a clear view of all your newsgroup subscriptions, threads, and messages.
- 2 Gravity highlights valid URLs so you can activate them

you to establish your newsgroup subscriptions. The interface lets you narrow down the newsgroups list by keyword.

The main screen offers the typical collection of newsgroups, subjects and threads, and articles windows. You can select alternate screen layouts as well. In addition, a plethora of configuration options is available, almost all of them conveniently organized under the Options panel; you can easily find the rest using the intuitively organized interface.

Gravity can send "keep alive" messages to the news server to avoid disconnection, though these are considered annoying by news server system and network administrators. And Gravity can download new articles automatically at user-defined intervals. The product also includes Image Gallery, a comprehensive binary attachments manager that shows you a list of downloaded binaries and lets you delete them from disk, shows and lets you manage the queue of binaries to download, and allows you to launch a selected binary. If you don't use Image Gallery, the status bar keeps you informed of the current background task that Gravity is executing.

And background tasks don't interfere with your news reading or the use of your computer. Gravity elegantly handles multiple threads, letting you read news while it downloads articles and/or attachments in the background.

Gravity has no newsgroup categories, but you can filter by keyword, line count, and the like. And if you're looking for specific information but don't want to use the keyword feature, Gravity has a great search function that allows you to search message headers and bodies for keywords.

You can conduct searches on both locally stored and server-stored information.

We encountered two annoyances with Gravity, however: It lacks support for 7-bit encoding, and you have to acknowledge the failed decoding before the program can continue with other attachments. (Version 1.01 of Gravity, which should be out by the time you read this, puts the error in a text log file instead of producing a pop-up.) But if you are running Windows 95, Gravity is definitely the newsreader to use; it will leave you with a very small wish list of features or enhancements.

Gravity 1.0. List price: \$44.95. Requires: 486-based PC or better, 8MB RAM, 10MB hard disk space, Microsoft Windows 95 or Windows NT. MicroPlanet Inc., Raleigh, NC; 919-872-0389; fax, 919-790-7729; www.microplanet.com. **Circle 503 on reader service card.**

NetManage Inc.

Internet Chameleon

NetManage's Internet Chameleon 5.0 (\$35) includes a newsreader, NewtNews, in its Internet applications suite. As a suite it's a well-balanced product, but if you want serious news reading capabilities, don't look to NewtNews.

At first glance, the installation program seemed to be a well-behaved, Windows 95-aware application, but what followed was a disappointment. Long filenames are not truly supported; if you use them you'll run into problems using this 16-bit application, which NetManage revamped to look more like Windows 95.

When you run NewtNews for the first time, it asks you for your news server in-

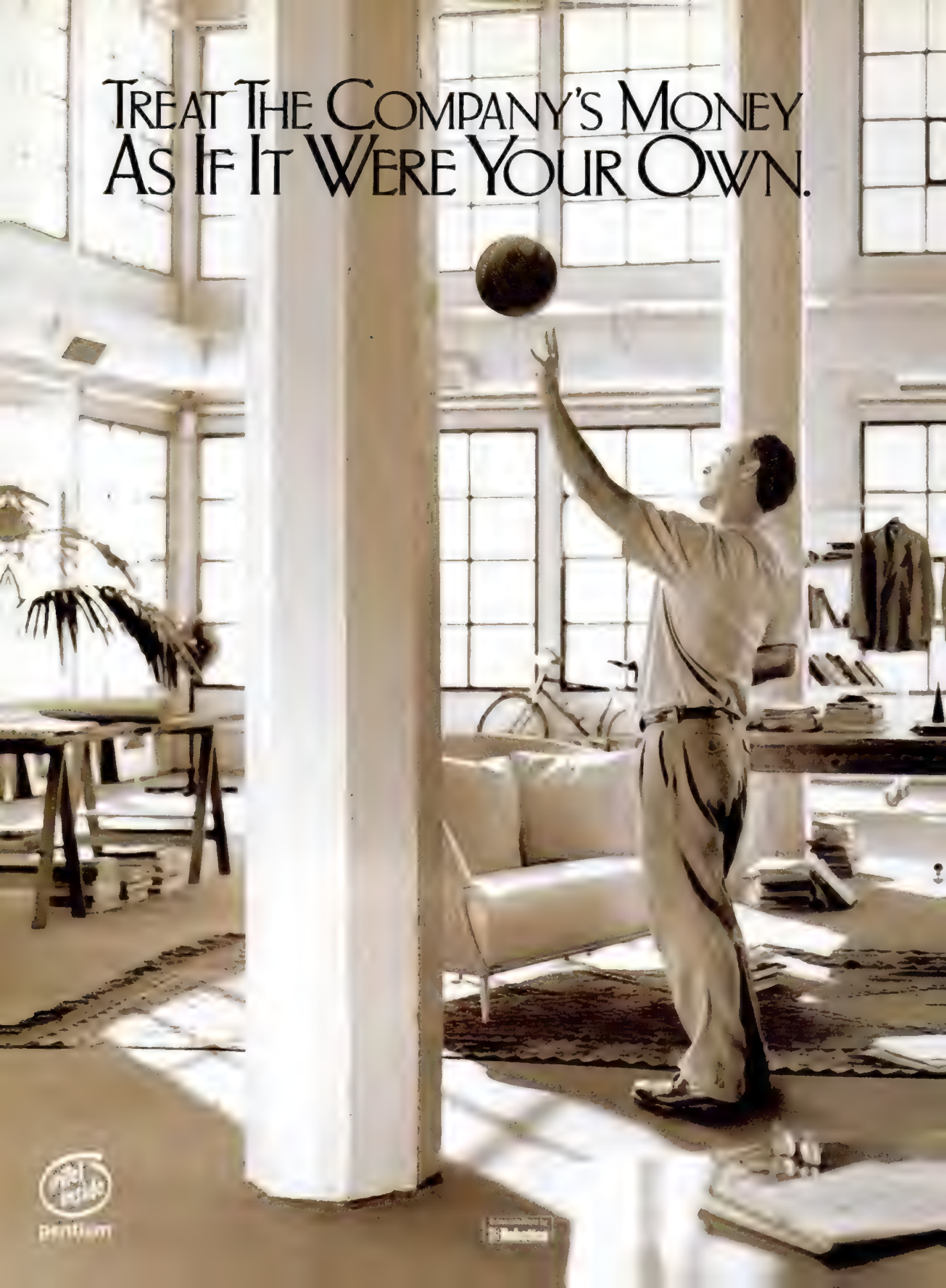
formation. However, just as the installation program's help text is unclear and incomplete, so is NewtNews's configuration panel. Unless you're familiar with Internet terminology, you'll need to refer to the user manual and online help files.

The user interface is austere. You get little interactive feedback as you position the cursor over buttons and menu items. And since it's basically an online newsreader, NewtNews gives you little in the way of off-line processing capabilities. The product frequently needs to retrieve information from the server to display newsgroup and article listings. If you're using a dial-up connection, be prepared for slow performance and long hours spent working your way around newsgroups.

NewtNews's message-threading capabilities are among its better features. You can expand and collapse threads, and the graphical interface clearly shows the flow of the message thread. But if you expect to download large amounts of binary attachments with NewtNews, consider getting another product. The right-click Download option is deceiving; one would think it downloads attachments, but in reality it only downloads a local copy of the news article, without decoding it. To decode, you have to open the article and use the Decode tool. And forget about multipart attachments: NewtNews can't handle them.

NewtNews lets you show and sort articles arranged by various header items, such as status, form, subject, and article number. The product does not include message-filtering capabilities. On the other hand, composing messages is quite simple. The address book is well designed and functional; it lets you create multiple

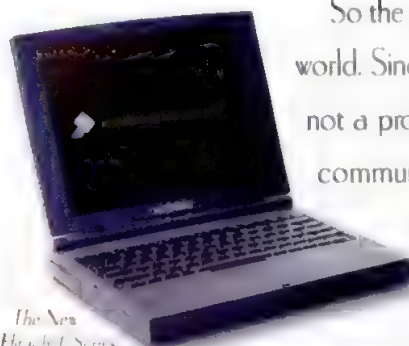
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In short, the Hitachi E Series has been honed for communications. The first thing it communicates is a healthy regard for your money.



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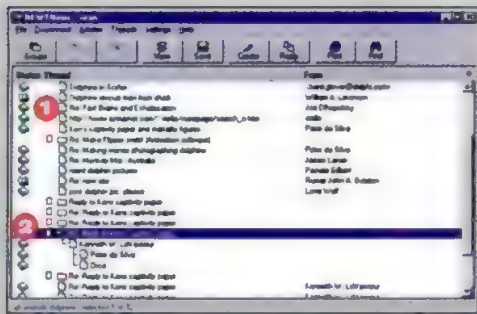
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COVER STORY

Newsgroup Readers



SUITABILITY TO TASK

Internet Chameleon

	Power	Ease
Installation and setup	Poor	Poor
Message threading and management	Fair	Good
Attachments	Poor	Fair
Posting	Fair	Good

NewtNews clearly displays read messages

1 and article threads 2

local address books or use remote ones. However, NewtNews does not support binary attachments, so you can't attach binary files to your postings—even though there's an Insert File option that lets you insert text files into a posting.

If all you're looking for is a bare-bones news package that will let you read articles and download the occasional binary file, NewtNews will perform adequately. **Internet Chameleon 5.0.** List price: \$35. Requires: 486-based PC or better, 8MB RAM, 15MB hard disk space, Microsoft Windows 3.1 or later. NetManage Inc., Cupertino, CA; 408-973-7171; fax, 408-257-6405; www.netmanage.com. Circle 504 on reader service card.

CompuServe Inc.

Internet In A Box



CompuServe's Internet In A Box 2.0 (\$19.95) is a product well suited for Windows 3.1 and Windows for Workgroups users. Windows 95 users will find better news support elsewhere, though.

Spry News is one of the applications that make up Internet In A Box. Installation and setup are easy. Configuring the product to use a dial-up Internet provider is very simple; you use CompuServe's dial-up networking. If you don't already have an Internet provider, the Internet In A Box setup program allows you to set one up through CompuServe.

Like OUI, Spry News ships with a pre-populated list of newsgroups; this speeds up your initial access to newsgroups. And the accompanying copy of *The Whole Internet User's Guide* will help you answer your newsgroup questions.

Spry News lets you define personal groups to help you organize newsgroups.

To subscribe to a newsgroup, you select it from the Newsgroup Browser and then either click on Subscribe or drag and drop its name into an appropriate personal group. Spry News comes with television, music, sports, and Internet groups, each presubscribed to popular newsgroups. To simplify subscribing, you can use a search term to locate other newsgroups.

Another unusual feature the product offers for managing newsgroups is the ability to display them either as a list or in tree-structure format. In the latter, only the top hierarchies are displayed; you work your way down the tree to locate the newsgroup(s) you want. And working offline is easy. Spry News will automatically make a connection to your Internet service provider whenever it needs to.

Spry News has great encoding and decoding support. It supports all popular encoding formats, including uuencoding and Base 64. Decoding is also easy: You simply select one of the binary attachment parts. Spry News figures out which parts to download, and then decodes them.

You can sort articles by author, date, number of lines, subject, and thread. Like some other products, Spry News does not support filters, bozo lists, or spam protection. Therefore, Spry News has no ade-

quate child-protection mechanism.

Despite Spry News' lack of filtering capabilities, it is well implemented. It has features that will help you easily manage your newsgroups, and it may be the best choice for users of Windows 3.1.

Internet In A Box 2.0. Street price: \$19.95. Requires: 386-based PC or better, 4MB RAM, 11MB hard disk space, Microsoft Windows 3.1 or later. CompuServe Inc., Seattle, WA; 800-777-9638, 206-957-8000; fax, 206-957-6000; www.sprynet.com. Circle 505 on reader service card.

Microsoft Corp.

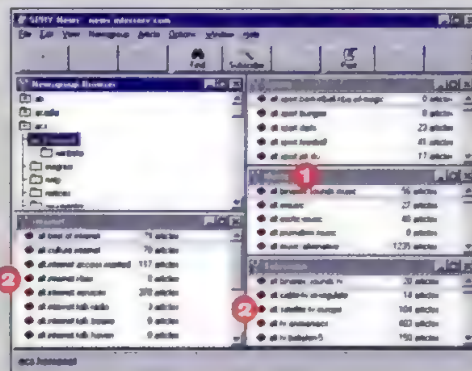
Microsoft Internet News

Microsoft's free utility, Internet News, requires you to install Internet Explorer, Version 3.0b2 or later. But in the next build, due by the time you read this, Internet News will be able to run as a standalone product.

Although not a complete newsreader, Internet News has the basic features required to read news efficiently and to extract binary attachments. We were surprised, though, at its lack of news-reading automation tools, including filters and rules.

Installing the Internet News add-on is very easy; a wizard guides you through the setup. The first time you run Internet News, it asks you for all the information needed to connect to your news server and download the newsgroups list; then you can subscribe to newsgroups.

The interface shows the article headers and message bodies in two windows. Message threads are indicated by a box; clicking on the box expands the thread one level. There aren't any menu options for expanding an entire thread or all threads, but these will appear in the next version.



SUITABILITY TO TASK

Internet In A Box

	Power	Ease
Installation and setup	Excellent	Excellent
Message threading and management	Good	Good
Attachments	Excellent	Good
Posting	Good	Good

1 Spry News has a handy personal folders feature that helps you keep your news subscriptions organized. 2 Dozens of popular newsgroups have been pre-categorized.

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PC Magazine Feb. 20, 1996*

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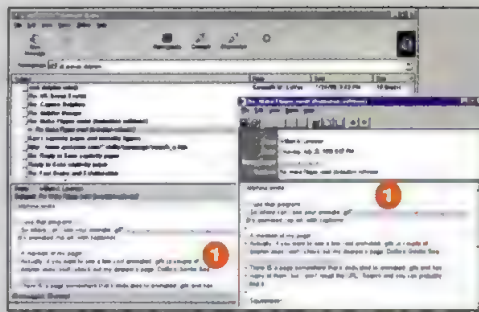
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COVER STORY
Newsgroup Readers



SUITABILITY TO TASK		
Microsoft Internet News		
	Power	Ease
Installation and setup	Excellent	Excellent
Message threading and management	Good	Good
Attachments	Good	Good
Posting	Good	Good

1 Users may find it confusing to see two copies of an article in Microsoft Internet News.

THE POSTS UP AHEAD

Reading postings can be a little confusing. Clicking on an article automatically retrieves it and displays it in the article body window. The automatic download is a bit annoying, especially when you're clicking on files with binary attachments. Double-clicking on an article brings it up in a detached window where message headers are added to the message display.

In this version, Internet News has no article filtering or watch or kill rules, which are all promised in the next release. However, you can sort messages by subject, sender, date, and size. You can also

mark selected messages and threads as read to skip them, as well as click on URLs within article headers or bodies. Clicking on a newsgroup URL opens the newsgroup in a separate window.

Internet News handles single-part attachments without special user actions. For multipart attachments, you need to select all the parts, click on Combine and Decode, and make sure they're in the correct order for decoding. A message-viewing window then lets you launch or save the attachment. By default, Internet News uses MIME encoding. The more traditional encoding method, uuencode, is sup-

ported as an optional encoding method.

Overall, Internet News offers good news reading capabilities and adequate attachment handling, though its lack of filter- and rules-based article handling makes it less appealing for advanced news readers. Still, as an add-on to Internet Explorer, Internet News may be the perfect newsreader for the beginner.

Microsoft Internet News (beta 3). List price: free. Requires: 386-based PC or better, 4MB RAM, 1MB hard disk space, Microsoft Windows 95 or Windows NT. Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080; fax, 206-936-7329; www.microsoft.com. **Circle 506 on reader service card.**

Netscape Communications Corp.

Netscape Navigator Gold

Netscape News is built into both Netscape Navigator Gold 3.0 (\$79) and Netscape Navigator (\$49). For this review, we looked at the version of Netscape News in Navigator Gold 3.0 (beta 5). Although not a very sophisticat-

Today's Storage

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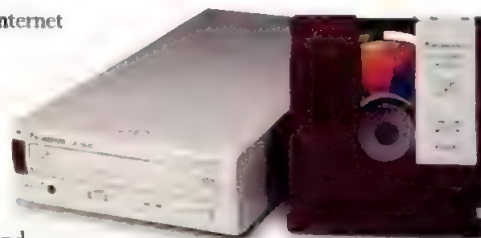
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PD optical media is rugged and reliable. It isn't affected by head crashes, stray magnetics, rough handling or most environmental hazards.

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including 3M brand by Imation and Panasonic. The versatile PD drive also plays all your CD-ROMs, photo-CDs and even audio CDs...flawlessly.

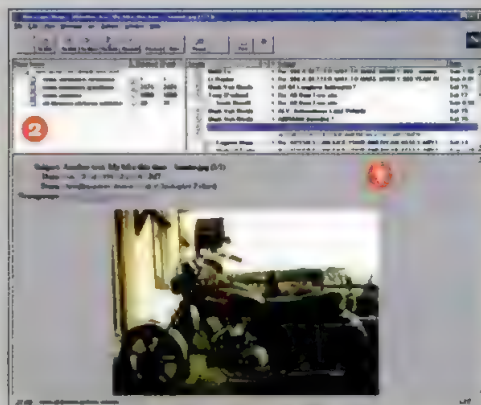
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SUITABILITY TO TASK Netscape Navigator Gold

	Power	Ease
Installation and setup	Good	Excellent
Message threading and management	Good	Good
Attachments	Fair	Fair
Posting	Good	Fair

1 Netscape News has a very well-organized interface that makes efficient use of your screen and lets you view graphics inline. 2 Your news subscriptions, even when provided by several different servers, are always clearly visible.

ed newsreader, Netscape News will let you keep track of newsgroups and download single-attachment binaries.

Installing Netscape Navigator Gold is easy. Just download the installation file via FTP, launch it, and let Netscape do the rest. As with Navigator, you can expect to be up and reading news in no time.

Netscape News graphically displays a tree of news servers and the newsgroups to which you're subscribed on that server. This design makes managing newsgroup

subscriptions across servers easy.

Unfortunately, Netscape News isn't very smart, optimized, or Internet- and network-friendly. For example, if you view all newsgroups, Netscape News retrieves and displays the number of total and unread articles in each newsgroup whether or not you've subscribed to them. This is an unnecessary and time-consuming process which, especially over a dial-up connection, can be very frustrating.

And subscribing to newsgroups is in-

convenient. You either have to know the full name of the newsgroup, or you have to look through the entire newsgroups list.

To offset this inconvenience, Netscape News includes the newsgroup distribution for the article being displayed. This feature lets you switch to related newsgroups by simply clicking on the newsgroup name from the article view window, which at least makes it easy to locate and subscribe to newsgroups that interest you.

In addition, the articles window is well organized and easy to read; threads are supported and clearly marked. To view an article, just click on its subject. Netscape News also automatically decodes and displays attached images as inline graphics. But it doesn't handle multipart attachments; you have to download each part, reconnect all of them, and decode by hand. And Netscape News doesn't include any tools that can decode a group of files as a batch—saving attachments to disk is a manual process.

Posting a new article is not intuitive. The Netscape News interface relies heavily on right-click-activated menus. How-

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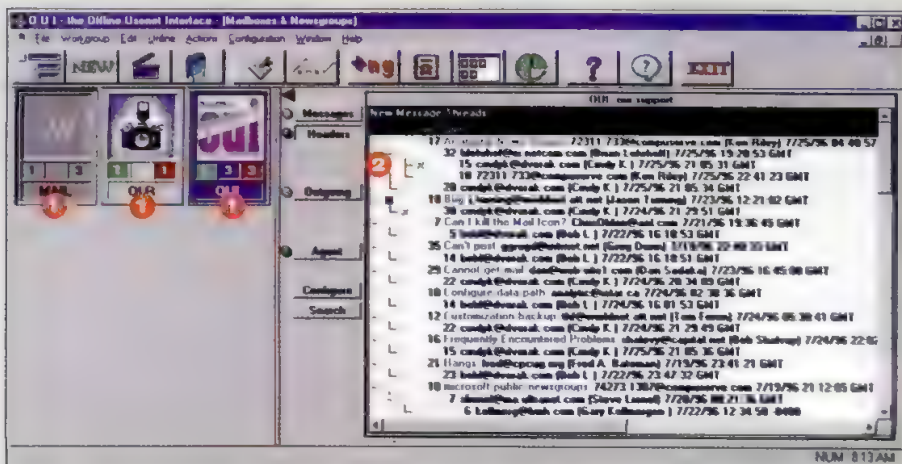
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OVI

OUI's interface may take getting used to, but its functionality helps minimize online costs.

OUI 1.5. List price: \$49. Requires: 386-based PC or better, 4MB RAM, 11MB hard disk space, Microsoft Windows 3.1 or later. Dvorak Development & Publishing Corp., Louisville, CO; 303-661-0345; fax, 303-661-0635; www.dvorak.com. *Circle 507 on reader service card.*



SUITABILITY TO TASK		
	DUI	
	Power	Ease
Installation and setup	Excellent	Excellent
Message threading and management	Good	Good
Attachments	Good	Good
Posting	Good	Good

1 OUI boasts an unusual interface that shows newsgroups as icons. **2** The message thread window, compared with that of other products, is quite spare but still highly functional.

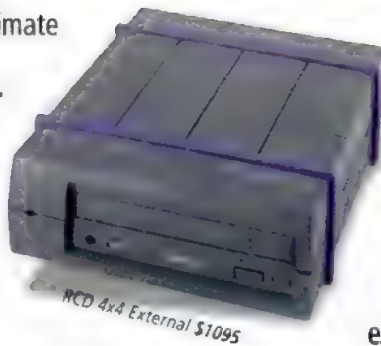
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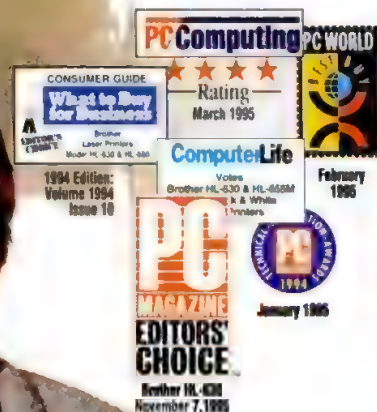
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E-MAIL: Building THE PERFECT IN-BOX

ALMOST OVERNIGHT, Internet mail has turned into the best way to get in touch with everyone. The Internet e-mail client on your computer can exchange mail with anyone else connected to the Internet, no matter what software or computer platform is at the other end of the connection.

Only a few years ago, if you used electronic mail at all, you probably used proprietary software like cc:Mail, Lotus Notes, or Microsoft Mail to communicate within the confines of a local area network, or you communicated only with other subscribers to a proprietary service like MCI Mail or

Internet e-mail is now
obligation to the
LAN-based and proprietary
e-mail that we've been
using for years.

an online service like CompuServe that required special-purpose software. Now you can choose among dozens of Internet mail programs—many of them free for the download—and the traditional proprietary software and services are scrambling to open themselves to the Internet.

Internet mail programs are called *mail clients* because they receive mail from a mail server on a computer elsewhere on your LAN or at the site of your Internet service provider. Some clients can do little more than send and receive text files and *attachments*—binary files encoded into alpha-

By *Jeffrey A. Hirsch*

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numeric characters by the sending client and decoded back into binary format by the receiving client. Some clients use filtering "rules" to check incoming messages for specified senders or text and sort the messages into different folders according to what they find. Still others add rules that can respond automatically to messages containing specified text—and even delete them before you see them.

Some clients that use rules first file all messages to a central in-box and refile them only after you've viewed them in the in-box. If you receive no more than a few dozen messages per day, this method makes it easy to keep track of your mail. But if you get hundreds of messages, then you probably want many of them automatically filed where you don't have to see them unless you wish.

WHAT YOU SEND AND WHAT THEY GET

The basic text of the message you send from your mail client will almost certainly get through to its recipient, but you can't predict what will happen to binary attachments, requests for a return receipt, and special-purpose headers like routing slips. What gets through to the recipient depends on the gateway software that receives mail at the recipient's network server and passes it on to the recipient's mail client. For security reasons, or simply through outdated design, some gateways discard file attachments or strip off message headers that

they don't recognize. Some mail systems respond to a request for a return receipt; others ignore it.

Various encoding systems let you attach binary files to messages. The older Unix uuencoding standard and the common Macintosh BinHex standard are being replaced by the more robust MIME standard supported by all modern mail clients (see the glossary below). However, no standard exists for embedding attachments in midmessage, with text following the attachment, and each client handles such embedded attachments differently. A few clients display attachments in-line, in the same window with the surrounding text; most make you open a separate window to view attachments.

For this story, PC Labs tested 12 of the most prominent Internet mail clients, ei-

ther shipping products or freely available downloads. Microsoft Internet Mail and Netscape Mail are tightly integrated with their respective Web browsers; the others are standalone utilities or part of a suite. All are supported either by telephone or by printed manuals. Other shareware and freeware programs are widely available but generally unsupported.

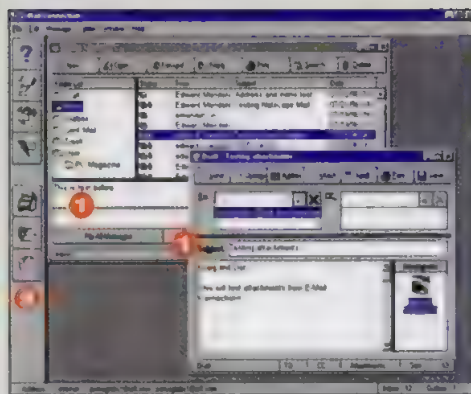
ConnectSoft Inc.

E-Mail Connection

ALL REVIEWS BY EDWARD MENDELSON

E-Mail Connection 3.0 connects you to everything. It supports Internet mail through the POP standard, online services like CompuServe, and proprietary systems like MCI Mail, as well as pagers, Lotus Notes, Novell MHS, and fax.

ConnectSoft's \$49.95 package makes it



SUITABILITY TO TASK

E-Mail Connection

	Power	Ease
Installation and setup	Excellent	Good
Mail creation	Good	Good
Mail management	Good	Excellent
Off-line functionality	Good	Good

1 E-Mail Connection has a preview pane showing a message's text, but if you want to open the attachments, you must open a separate window. 2 The bottom button represents the open message window.

GLOSSARY

New Terms for Your In-Box

Alias or nickname A stand-in for a standard e-mail address. The alias is usually a plain-English phrase that calls up a longer address (for example, "John Doe" for JDoe@site.com).

IMAP (Internet Message Access Protocol) A protocol similar to the POP protocol. It contains additional features, such as the ability to search your mail by keyword without storing the mail locally.

IMSP (Interactive Mail Support Protocol) A protocol set still under development at Carnegie-Mellon that promises to extend IMAP4's abilities to let you subscribe to bulletin boards and mailboxes or find and search address books

MIME (Multipurpose Internet Mail Extensions)

A type of encoding used to transport non-ASCII files (such as spreadsheets, executables, and the like). MIME supports multiple-part binary attachments. The IMAP4 protocol contains automatic support for MIME encoding and decoding.

POP (Post Office Protocol) A protocol used to retrieve e-mail messages. An early version called POP2, originally standardized in the mid-1980s, required SMTP in order to send messages. POP3, the current extension of POP, can be used together with SMTP or on its own to send and receive e-mail messages.

SMTP (Simple Mail Transfer Protocol) A protocol used for sending e-mail messages. An attempt to

expand it for both sending and receiving fizzled, and the pairing of the mail-messaging protocol SMTP with POP became the norm.

Telnet A protocol used to log on to a remote system. A telnet client is the software that allows end users to make such a connection and to command a terminal or server remotely.

Uuencode/uuencode The preeminent set of encoding and decoding algorithms that allow files to pass from one e-mail service to another. The sender's PC converts files to ASCII text, which the recipient can decode, reconstructing the original data. (Originally the terms stood for *Unix-to-Unix encode and decode*.)

blissfully easy to address, send, and reply to your messages, and includes a thorough set of options for automatically filing incoming mail, quoting mail in replies, and managing attachments. E-Mail Connection is a 16-bit program that doesn't try to integrate itself into Windows 95, and its interface won't win any beauty prizes, but it's the only program that connects to almost every known mail service.

E-Mail Connection's clear graphic interface's large toolbar buttons give quick access to the in-box and address book, and additional buttons appear whenever you open or compose a message. Everyone who sends you mail can be automatically added to your address book, and a pop-up offers to add any new address that you type when sending a message. The address book supports aliases and mailing lists. Message templates let you store boilerplate text. You add attachments from a Windows File/Open dialog box, and an icon for each attachment appears in a separate panel in the editing window.

The in-box, out-box, and user-created mailboxes display a top pane with a list of messages and a lower pane with the text of the current message. You don't need to open a message in its own window unless you want to edit it or manage attachments, a clumsy process in which you must save them as a file before you can view them.

Message management rules move messages to specified folders depending on the text found in the headers or body of the message. These rules apply only when you click on a button in the in-box window, so messages don't disappear into folders without getting your attention in the in-box first. A well-designed search feature lets you specify which folders and which fields to search.

Installation subtracts 10MB from your available hard disk space. This overhead is partly wasted on modules that connect to mail systems you don't use, and partly wasted on the program's TCP/IP software—which it installs even if Windows 95's Dial-Up Networking is

Standalone e-mail:

Pronto 96

Integrated e-mail:

Microsoft Internet Mail Netscape Navigator Gold 3.0 (Netscape Mail)

If your browser doesn't have built-in e-mail, or its built-in e-mail tool is underpowered, our Editors' Choice Pronto 96 is your Internet e-mail solution.

Its effective rules-based message handling helps you organize a flood of e-mail. It combines an attractive and intelligently designed interface that lets you perform most functions with one or two keystrokes with the ability to search for specific text across multiple folders.

To this mix, Pronto also adds a message preview pane not found in many other mail applications. Drag-and-drop operation as well as wizard-style dialog boxes rounds out this impressive standalone e-mail tool.

It's unlikely that you'll drop your browser's built-in Internet e-mail ca-

pabilities for any one of the other standalone products reviewed here. The mail tools that come with Microsoft Internet Explorer (Microsoft Internet Mail, beta 3) and with Netscape Navigator Gold 3.0 (Netscape Mail) are both highly capable products, each worthy of our Editors' Choice, though neither on its own is enough to make you want to switch from one browser to the other.

Where Netscape's mail program displays the full content of messages—without making you open a separate window—and sends entire Web pages via e-mail, Explorer's Internet Mail offers strong message-handling rules and an easy-to-use interface—and it's free.

Internet Chameleon (which comes with an entire suite of tools) merits an honorable mention here, too. It has rules-based message handling and adds the ability to download the message headers in order to save even more time and fuss. The interface is functional but not outstanding; Internet Chameleon would do better if it were as adaptable as its lizard namesake.

Pegasus Mail—free for the download—is worth considering if you want the most elaborate message-filtering rules available and you don't mind an awkward interface.



already on your system. But despite minor glitches and an outdated 16-bit interface, E-Mail Connection truly offers a unique range of features and exceptionally convenient handling of your Internet mail.

E-Mail Connection 3.0. List price: \$49.95. Requires: 486-based PC or better, 8MB RAM, 10MB hard disk space, Microsoft Windows 3.1 or later. ConnectSoft Inc., Bellevue, WA; 800-889-3499, 206-803-3039; fax, 206-822-9095; www.connectsoft.com. Circle 508 on reader service card.

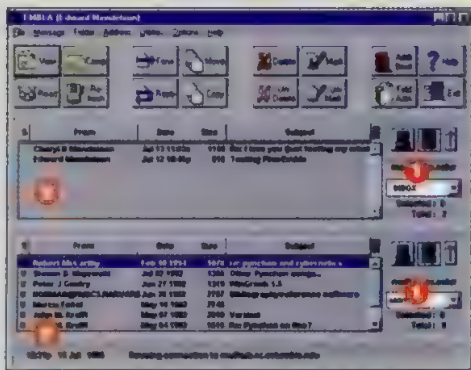
The TeamWare Group

Embla

The TeamWare Group's Embla 1.2, priced at \$49, is one of only a few Windows mail clients that use the IMAP protocol instead of the more common POP protocol. Although it convincingly demonstrates IMAP's flexibility and power, Embla's interface and features lag behind almost all POP-based programs.

Through IMAP, Embla lets you drag and drop messages between folders on a remote mail server, or between a folder on the server and a folder on your hard disk, but it's much less convenient when you attempt basic tasks such as writing and replying to messages, and it entirely lacks mes-

Our Contributors: EDWARD MENDELSON is a contributing editor to *PC Magazine*. DAN SMITH is an associate project leader, and ARIE MOLLER is an editorial researcher at *PC Magazine*. LANCE N. ULANOFF was the senior associate editor in charge of this story.



SUITABILITY TO TASK		
Embla		
	Power	Ease
Installation and setup	Excellent	Fair
Mail creation	Excellent	Poor
Mail management	Fair	Good
Off-line functionality	Fair	Fair

1 Embla lets you divide its message list window between local and remote folders. 2 You can move a message from the server to your hard disk by dragging it between the two panes.

sage management rules. By the time you read this, Embla 2.0 will be on the market and should include management rules. A separate version, Embla Lite, priced at \$29 and not tested by PC Labs, uses a similar interface to support POP mail.

Embla's interface includes two rows of toolbar buttons over a window that lists messages in your in-box or any other folder, including any folders that you create with Embla on your disk or server. A group of icons to the right of the message list lets you access mail on your local machine or the remote server, and a drop-down list lets you select a folder on the machine you choose. Another icon splits the message list window into two panes representing different folders. By dragging message headers between these panes, you can drag messages between the server and your local machine.

Creating even a simple message in Embla may well frustrate you: Starting from a complex Compose window, you

must open a separate dialog box where (if you don't enter an address by hand) you select addresses from one or more address books, which can include shared remote address books. Embla also lacks quick-addressing features like aliases. Back at the Compose window, you click on the New Text button to open either an internal Notepad-style editor or any other editor you specify. After entering the message, you close the editor to return to the main Compose window, where you can add attachments or send your message. The whole process is far more complicated and time-consuming than is necessary.

Reading and replying are just as complicated. Text-only messages open in Embla's editor, but you can't reply until you close the editor window or move it out of the way (you can't minimize it) to click on the Reply button on the main toolbar. If the message includes attachments, Embla opens a complex View window

where you view the text and attachments by clicking on icons. Embla doesn't support automatic filing, and you have to move messages to storage folders by hand.

Embla often feels more like a demonstration of IMAP technology than a usable application. If you need IMAP, it's one of the few available choices, but until Embla's interface matches its technology, you'll probably prefer to look elsewhere.

Embla 1.2. List price: For 1 user, \$49. Requires: 386-based PC or better, 4MB RAM, 2MB disk space, Microsoft Windows 3.1 or later. The TeamWare Group, San Jose, CA; 888-248-9273, 408-432-1300; fax, 408-456-7272; www.teamw.com. Circle 509 on reader service card.

Attachmate Corp.

Emissary Desktop

Emissary Desktop 2.0 is a tightly integrated 16-bit Internet access program with the only Internet-based mail client on the market that lets you place an image anywhere in a message, even in the middle of a sentence.

Such a feature is normally available only in proprietary-standard mail software such as Lotus's cc:Mail or Microsoft's Exchange, but the POP-based mail client in Attachmate Corp.'s \$99 package performs this graphics feat using Internet-standard MIME encoding.

Unlike most other mail clients, Emissary displays file attachments as in-line icons or images, rather than as icons or filenames listed in a separate window. You

INTERNET E-MAIL CLIENTS

How to Read the Suitability to Task Boxes

Installation and setup We measure the ease with which the products can be installed and used. We look at each program's ability to integrate with the existing Winsock protocol or provide its own. We also determine if the package permits multiple accounts, allows schedule retrievals, and recognizes signature files, or helps you create them.

Mail creation options We go from broad issues (how easy is it to set up a message?) to details (can the package spell-check?). We determine how easy it is to add a new address or create a mailing list, and how or if the package accepts aliases. We also look

SUITABILITY TO TASK		
Product name		
	Power	Ease
Installation and setup	Poor	Poor
Mail creation	Fair	Fair
Mail management	Good	Good
Off-line functionality	Excellent	Excellent

into whether and how well the package supports MIME and mail attachments, as well as other emerging or popular encoding and decoding schemes.

Mail management We look at the product's ability

to schedule regular mail checks and create folders for sorting and storing your mail. We examine the package's filtering capabilities and its support of rules-based message handling for routing your mail to appropriate folders.

Off-line functionality Here we look at the product's ability to respond to messages without being connected to a server and to keep a queue of off-line messages. We look at how well the product integrates with the address book while off-line. We also look at priority settings and the customization of off-line queues.

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†Standard on 133 and 166 MHz models, optional on all other models. *Other capacities available. †Standard on CD, MC and MCx models. *Multimedia models only. †On-site, second-day business service.
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SUMMARY OF FEATURES

Internet E-Mail Clients

PC MAGAZINE
EDITORS' CHOICE

■ YES ■ NO

Products listed in a alphabetical order

	E-Mail Connection 3.0	Embla 1.2	Emissary Desktop 2.0	Eudora Pro 2.2	Internet Chameleon 5.0	Internet In A Box 2.0	Microsoft Internet Mail
Supports multiple address books	■	■	■	■	■	■	■
Nicknames or aliases	■	■	■	■	■	■	■
Can create mailing lists	■	■	■	■	■	■	■
Can schedule mail checks	■	■	■	■	■	■	■
Can download headers only	■	■	■	■	■	■	■
Contains preview pane for messages	■	■	■	■	■	■	■
Supports multiple accounts in the same session	■	■	■	■	■	■	■
POP/IMAP support	■	■	■	■	■	■	■
Message templates	■	■	■	■	■	■	■
MIME/uuencoding	■	■	■	■	■	■	■
Automatic filing rules	■	■	■	■	■	■	■
Automatic replies	■	■	■	■	■	■	■
URLs contained in message launch browser	■	■	■	■	■	■	■
Internal spell-checker	■	■	■	■	■	■	■
Can quote replies	■	■	■	■	■	■	■
Supports multiple signature files	■	■	■	■	■	■	■

can get Emissary's unique mail client only by loading your disk and RAM with the complete package, which launches a proprietary Web browser, news reader, telnet client, and file manager even when you only want to send and receive mail. If you prefer a different Web browser from the one in Emissary's package, the program gives you more software than you need, but it's the one to choose for exchanging graphics-intensive mail over the Internet.

The single-window interface consists of a tree-structured list of the program's modules, a toolbar that can be reduced to text buttons, and a large double window with a list of messages at the top and the content of the current message at the bottom. You can start composing a message in half a dozen ways: from the menu or toolbar, by dragging an address icon from

the address book to the Mail icon, or by dragging a text or image file from Explorer or Emissary's own file manager onto the Mail icon, an action that opens that file in the message editor. You specify in the address book whether a recipient should get MIME, uuencoded, HTML-formatted, or plain-text messages.

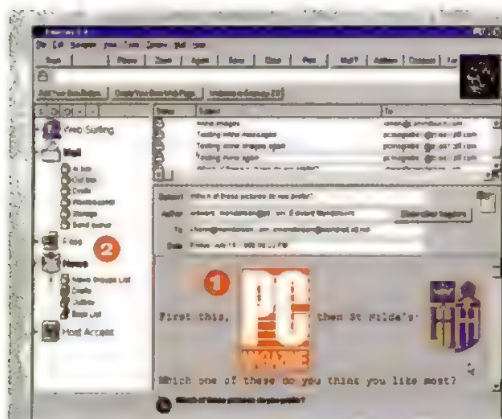
Graphics files in .BMP, .GIF, or JPEG format that you insert in a message appear as images, not icons; other file types are represented by icons. Your message recipients who use Emissary will see exactly what you intended; users of Navigator Mail will see an approximate version, with horizontal rules inserted above and below each graphic. Every other mail client either displays text and graphics in separate windows or represents images by filenames, but Emissary's graphics-

rich style is the wave of the future.

On the other hand, Emissary doesn't let you send a full Web page so that you can "attach" an Internet address from the same dialog box you use to attach files. Unlike Internet Chameleon and Navigator Mail, which display the mailed page, Emissary—as well as Microsoft Internet Mail—tries to run the URL for www.pcmag.com as a DOS program with a .COM extension.

You can set Emissary to retrieve only headers when it checks your mail, and then retrieve full messages when you click on the headers in the message list. Filing rules automatically reply to messages or store them in specified folders without going to the inbox first, and you can create "agents" that collect mail and post automated responses while you're away from your machine.

The program comes with its own dialer and won't trigger Windows 95's auto-dial feature, but it works over any Internet connection you open using the Windows 95 dialer. As an all-in-one product, Emissary faces strong competition from the mail and news features of Internet Explorer and Navigator, but if you require graphics-based mail, Emissary is your best choice. **Emissary Desktop 2.0.** List price: \$99. Requires: 486-based PC or better, 8MB RAM, 4MB hard disk space, Microsoft Windows 3.1 or later. Attachmate Corp., Bellevue, WA; 800-426-6283, 206-644-4010; fax, 206-649-6662; www.attachmate.com. Circle 502 on reader service card.

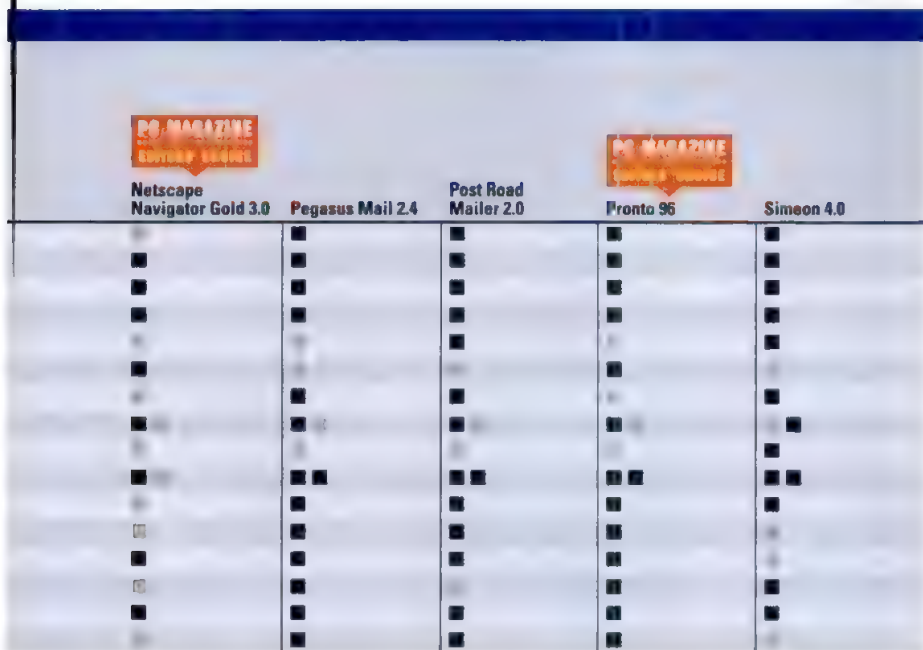


SUITABILITY TO TASK

Emissary Desktop

	Power	Ease
Installation and setup	Good	Good
Mail creation	Excellent	Good
Mail management	Good	Excellent
Off-line functionality	Good	Excellent

- 1 Emissary, unique among current mail clients, can display images in the middle of sentences or anywhere else in a document.
- 2 You can drag and drop images or messages from anywhere in Emissary's tree-structured list of messages.



Qualcomm Inc.

Eudora Pro

Qualcomm's Eudora comes in two versions, Eudora Light, which you can download free from Qualcomm's Web site, and Eudora Pro 2.2, which costs \$89 for private or commercial use, \$44.50 for college students, or \$69 for anyone who downloads it via FTP from Qualcomm's Web site. Thanks to their clean design and intelligent feature set, these very similar programs rank among the most widely used POP-based mail clients on the planet. And although other programs have more advanced message management and a more convenient interface, both Eudora versions deserve their popularity.

For this review, PC Labs tested Eudo-

ra Pro. It uses a multiwindowed interface, with overlapping or tiled windows for your in-box, your out-box, and any other folders you create. The message lists show only the main headers and lack the preview pane found in some newer programs, but after you click on a header to view a message, you can use toolbar buttons or the keyboard to jump to the next or preceding message without returning to the list. A horizontal scroll bar lets you move left or right through the columns in the spreadsheet-style message list. Confusingly, the headings of the columns don't scroll with them, which produces column headings unrelated to the information below them.

To create and send a message, you simply press a shortcut key or icon to open a window that looks like a printed-

out message, with blank fields for the address, subject, and text; just fill in the blanks and press the Send button. If you have defined nickname aliases in your address book, you can type in the first few letters of a nickname, then press Ctrl-<Comma>, and the full alias is entered automatically. A nickname can represent a mailing list, and mailing lists can include the nicknames of other mailing lists.

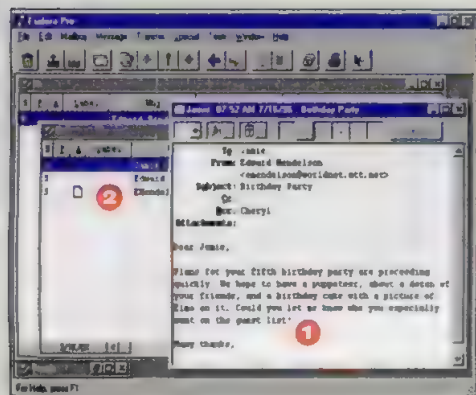
You can attach a file to a message by dragging an icon from Windows Explorer and dropping it into the message window. You can choose among the MIME, uuencode, and Macintosh-style BinHex formats for encoding attachments.

When you receive a message with an attachment, the attachment is automatically saved to a directory you specify in the program options, and you can open the file with the default Windows application for its file type by clicking on the filename in the Attachment field. If you click on a URL address in a message, it automatically opens in your default Web browser.

By default, Eudora stores messages in the in-box and out-box, but you can create a simple or confusing system of folders within mailboxes and mailboxes within folders. An elaborate system of filing rules automatically moves messages to folders—without sending to them to the in-box first—and these rules optionally assign priority and color coding to stored messages, but they can't send automated replies.

Version 3.0 of Eudora, due by the time you read this, will add message templates, enable automated replies, enhance the rules feature, and let you limit text searches to one mailbox or folder. Even without these and other scheduled enhancements, Eudora Pro (with 16- and 32-bit versions shipping in the same box) probably has all the strength, flexibility, and ease you want from your Internet e-mail software.

Eudora Pro 2.2. List price: 16- and 32-bit versions, \$89 (for college students, \$44.50; for FTP download, \$69). Requires: 386-based PC or better, 4MB RAM, 3MB disk space, Microsoft Windows 3.1 or later. Qualcomm Inc., San Diego, CA; 800-238-3672, 619-658-1291; fax, 619-587-8276; www.qualcomm.com. Circle 510 on reader service card.



SUITABILITY TO TASK

Eudora Pro

	Power	Ease
Installation and setup	Excellent	Good
Mail creation	Excellent	Good
Mail management	Good	Good
Off-line functionality	Excellent	Good

1 Eudora Pro displays messages in a plain-text window that, more than any other such window we saw, looks like the actual text sent across the Internet. 2 Attachments, if any, are listed as filenames that open when you click on them.

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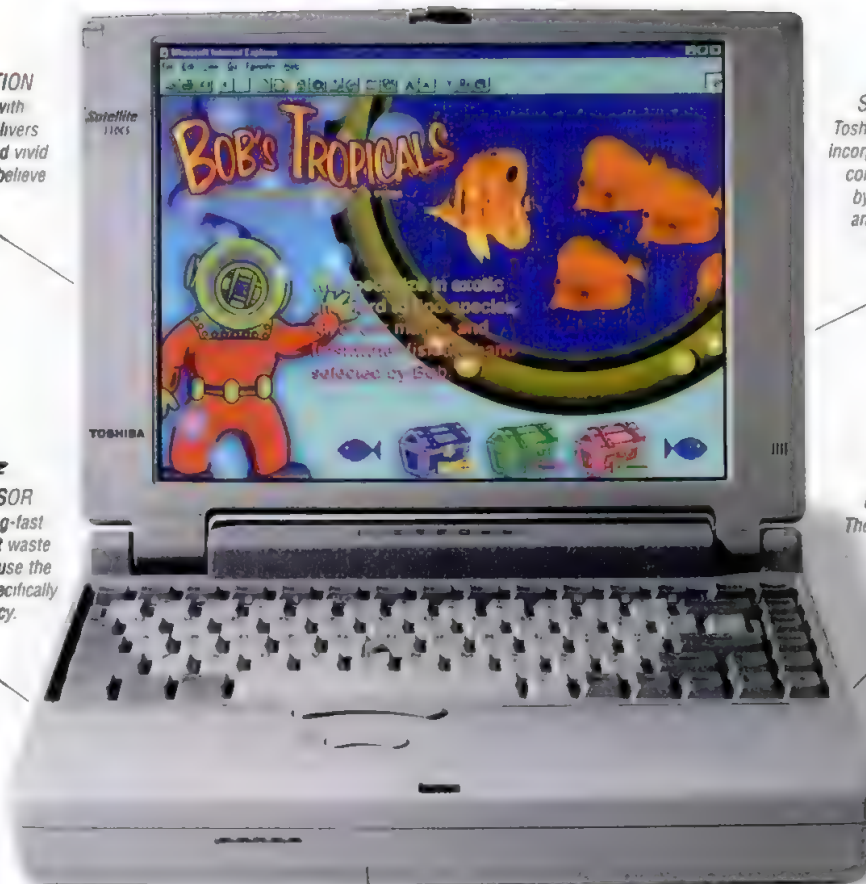
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CIRCLE 379 ON READER SERVICE CARD

Protecting Yourself from Evil E-Mail

By Arie Moller

While Internet e-mail provides a convenient method for communication, it also unfortunately provides an equally easy way for viruses to infect systems. The major stand-alone antivirus products, such as Symantec Corp.'s Norton AntiVirus, scan programs on execution but not e-mail attachments—unlike the products we look at here.

Two types of solutions are available to protect your system from e-mail-borne viruses. The first is server-based: A program scans e-mail attachments as they pass through the e-mail gateway. The second approach is desktop-based: Each individual client scans the mail with an antivirus tool.

Server solution **MIMESweeper**, direct-priced at \$995 for a 25-user license and \$7,000 for a 1,000-user license, from Integralis Inc. (206-889-4724; www.integralis.com), focuses on the detection and quarantine of infected files. The product itself doesn't



perform scanning and disinfection but uses your existing antivirus product as a proxy once it has reconstructed e-mail attachments. You can configure it to run most popular scanners.

InterScan E-Mail VirusWall, \$995 direct for a 50-user license, from Trend Micro Inc. (800-228-5651; www.antivirus.com), is another server solution. You can update its pattern file automatically by downloading the latest files from the Internet. VirusWall is available for either the Windows NT

Server platform (Version 3.5 or higher) or various versions of Unix.

McAfee Associates Inc. (408-988-3822; www.mcafee.com) has antivirus tools for the desktop as well as the server, both of which use the same scanner technology found in McAfee's flagship product, **Virus-Scan**. The client-side product, **Web-Scan** (\$30 street price), comes bundled with Pegasus Mail, an e-mail client reviewed in this story, and Spry Mosaic. As of press time, WebScan will scan your mail only if you use cc:Mail or Pegasus. McAfee is working on a patch to scan the Microsoft Exchange in-box.

McAfee's server product **WebShield** (\$3,995 direct for a two-year subscription to a site license) will be available for Unix by the time you read this. The Unix version will ship with a licensed copy of the Unix OS and GUI remote-administration utilities for Windows 95 and NT. McAfee plans to follow up with a full Windows NT version.

NetManage Inc.

Internet Chameleon

NetManage's \$35 Internet Chameleon 5.0 is an integrated suite of standard Internet applications, including a compact POP-based mail client that's more powerful than it looks and ranks with the best of its kind.

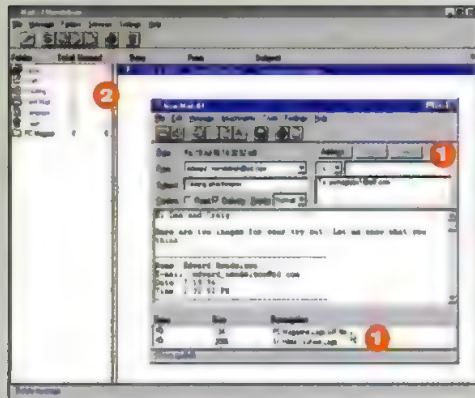
In appearance, the 32-bit suite for Windows 95 dates from the Windows 3.1

era—a matching 16-bit Windows 3.1 version comes in the package—and it lacks high-end features like the ability to search for text in anything outside the current message. But its command structure is sleek, fast, and efficient, and it includes rarely seen Internet mail features. For example, you can attach a routing slip to mail you send to other Chameleon users, complete with routing options that let you specify whether the message can be al-

tered by recipients, and whether you want to be notified as the message makes its rounds—a feature that won't work with some nonstandard servers.

The interface displays a folder list in one pane and a message list in another; no preview pane is provided, but when you view a message, the toolbar and keyboard let you jump quickly to the next or previous message. You compose messages in a tightly organized editing window, with buttons and scroll lists for choosing addresses. Shortcut keys and icons make every feature easily accessible, and all features are interconnected, so you can type a name into a routing slip and add it to the address book at the same time. Only two keystrokes are needed to copy a name in the From field of a message into the address book, and although you can create multiple address books and mailing lists, you can't create nicknames or aliases.

To add MIME or uuencoded file attachments you either open a dialog box—complete with a button that lets



SUITABILITY TO TASK		
Internet Chameleon		
	Power	Ease
Installation and setup	Excellent	Good
Mail creation	Excellent	Good
Mail management	Good	Excellent
Off-line functionality	Excellent	Good

1 Internet Chameleon's mail client, notable for its compact, feature-filled interface, displays optional descriptions of attachments to files. 2 The folder list makes it easy to see whether any automatically filed messages haven't been read yet.

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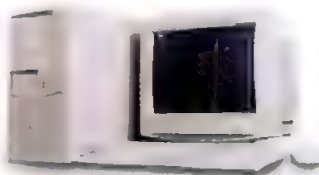
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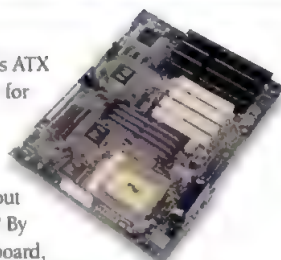
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you view the contents of the listed files—or simply drag a file from Windows Explorer to the message-editing window. A pop-up dialog box lets you add a descriptive name to the attachment, and Chameleon lists attachments by name and description in a separate window at the foot of the message editor and views them with the standard Windows viewer for the file type.

You can set the program to download only message headers or to download headers only for messages above a specified size. Filing rules automatically forward or delete messages or move them into a specified folder; messages moved into another folder bypass the in-box, but because the folder list alerts you to unread mail in all folders, you won't miss any new mail.

The same mail client in Internet Chameleon is available from NetManage as a separate \$55 package called JetMail; the added price gives you LAN mail in addition to Internet mail. By the time you read this, JetMail will be replaced by NetManage's recently-acquired Z-Mail, which adds support for IMAP4, message encryption, HTML-formatted messages, and indexed text searching. For those who prefer an all-in-one suite, Internet Chameleon offers the advanced features and no-nonsense interface of high-end network software at an impressively low cost.

Internet Chameleon 5.0. List price: Windows 3.1 and Windows 95 versions, \$35. Requires: 486-based PC or better, 8MB RAM, 15MB hard disk space, Windows 3.1 or later. NetManage Inc., Cupertino, CA; 408-973-7171; fax, 408-257-6405; www.netmanage.com. *Circle 504 on reader service card.*

CompuServe Inc.

Internet In A Box

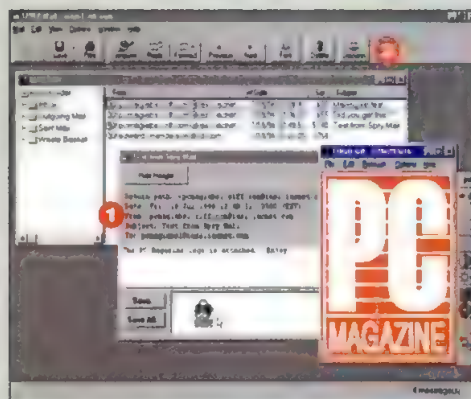
Internet In A Box 2.0 (\$19.95), an all-in-one package from CompuServe, was the pioneering Internet access suite when it was released in the Windows 3.1 era, but it's frustratingly limited in the era of Windows 95.

This 16-bit package includes a Web browser and a news reader, gopher and telnet utilities, and a POP-based mail client called Spry Mail. All offer a minimal feature set and work only with connections made through the dialer that

comes in the package. Even when a Windows 95 dial-up connection is open to the Internet, the applications in Internet In A Box ignore it and insist on using the Spry dialer to access your ISP. The same applications in Internet In A Box are also part of CompuServe's Internet Office (Navigator Edition with Netscape Navigator, \$199; Professional Edition,

stalls its own viewer utility as the default Windows viewer for these file types without bothering to ask your permission first. You can drag and drop messages between folders, but you can't create automated filing rules.

Spry Mail was an innovative, valuable product when Spry first released it two years ago, but we'd like to see CompuServe



SUITABILITY TO TASK

Internet In A Box

	Power	Ease
Installation and setup	Poor	Poor
Mail creation	Fair	Good
Mail management	Poor	Fair
Off-line functionality	Fair	Good

1 The mail client in Internet In A Box has fewer features than any other currently available mail client. 2 The interface, however, is straightforward enough for beginners to navigate easily.

\$399). This works with the Windows 95 dialer or any other network connection, but the applications themselves are just as minimal as they are in their Internet In A Box versions.

Spry Mail's chief merit is its simplicity. You can access all functions from a toolbar or menu, and the toolbar displays icons, text, or both. Folders and the messages they contain are listed in an Explorer-style two-paned window, but there's no preview pane; you must open a message before you can view its contents.

You compose messages in an editing window headed by a toolbar that lets you hide or display the message headers and the separate pane that opens when a message includes attachments. The address book, which opens when you click on the button next to the To: field, supports nickname-style aliases and lets you search for an alias by typing in its first few letters.

Attachments, which can be encoded in either MIME or uuencode format, are added either by selecting filenames in a dialog box or by dragging files from Explorer directly into the message window. You view attachments by clicking on their icons in a panel at the foot of the message window. Don't plan on using your favorite graphics viewer to look at .GIF or JPEG files, because Spry Mail in-

come out with a new, fuller-featured version. It's long overdue.

Internet In A Box 2.0. Street price: \$19.95. Requires: 386-based PC or better, 4MB RAM, 11MB hard disk space, Microsoft Windows 3.1 or later. CompuServe Inc., Bellevue, WA; 800-777-9638, 206-957-8000; fax, 206-957-6000; www.sprynet.com. *Circle 505 on reader service card.*

Microsoft Corp.

Microsoft Internet Mail



Microsoft's free Internet Mail client is a 32-bit POP-based mail client that offers a well-chosen set of basic features behind a simple, elegant interface. Just as Netscape Mail runs from within Netscape Navigator, Internet Mail can be run from within Microsoft Internet Explorer, but Microsoft's mail client can also run as an entirely separate program, and in almost every way it is simpler to use and more powerful than Netscape's. Internet Mail doesn't handle graphics as smoothly as Netscape Mail does, but its superb address book and customizable interface outshine Netscape's, and it includes message-filing rules that Netscape Mail doesn't support.

PC Labs tested the beta 3 version of Internet Mail. The program's main win-



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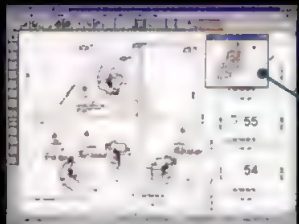
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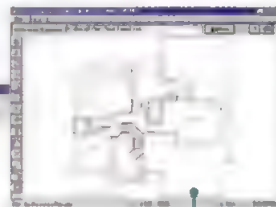
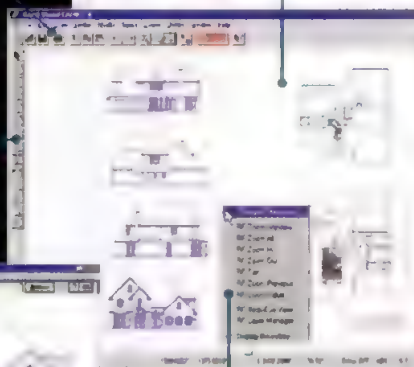
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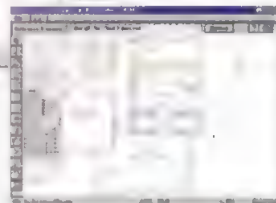


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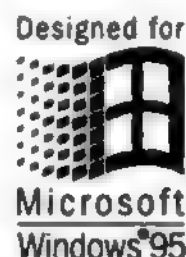
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Internet E-Mail Clients



down consists of a toolbar that you can customize so that it includes buttons for only the features you want, and a two-pane message display with message headers in the top pane and a preview of the opening lines of the current message in the bottom pane as the default. If a message is visible in the preview pane for 5 seconds or more, the program marks it as read, but you can change the number of seconds required or turn this feature off.

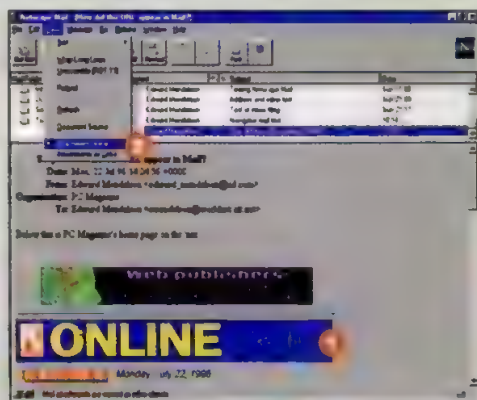
A paper-clip icon in the preview pane indicates that a message came with an attachment; you can click on the paper clip to view the attachment with the default Windows viewer for its file type. You can double-click on a message to view it in a separate window that lets you view all the message headers and add the sender's address to your address book, but this separate window seems redundant.

Unlike Netscape Mail, Internet Mail can't display images within the body of the message itself. Internet addresses that appear in messages are "live," so you can click on the address of a Web site and have the site itself open in your browser. But you can't send a full Web page that lets you "attach" an Internet address from the same dialog box you use to attach files; unlike Internet Chameleon and Netscape Mail, which display the mailed page, Internet Mail (like Emissary) tries to run the URL for www.pcmag.com as a DOS program with a .COM extension.

No other mail program is as helpful to beginners as Internet Mail, but its help won't get in the way of advanced users. When you create a new message, the To: and cc: fields have gray "click here" messages that remind you to add an address. You can choose recipients from an ad-

dress book that supports nickname aliases, builds mailing lists easily, and lets you enter detailed phone numbers and other data for each entry. Internet Mail can import addresses from your Exchange address book, but the program can't export addresses back to your book—a feature that will be available in the next release, which should be shipping by the time you read this. Filing rules let you save incoming messages directly to specified user-created directories, without filing them in the in-box first—a potential problem if you aren't careful to check all folders.

If you want a tree-structured list of multiple message folders, you won't like Internet Mail, which lets you create as many mail folders as you choose but displays the full list of folders only in an inconvenient drop-down list in the toolbar, without indicating which ones have new messages. (This last feature will appear in the next release.) It also doesn't let you drag message icons from one folder to another. Microsoft didn't design this program to compete with a full-featured system like Exchange, but if all you need is a fast, configurable mail



SUITABILITY TO TASK

Microsoft Internet Mail

	Power	Ease
Installation and setup	Fair	Excellent
Mail creation	Good	Excellent
Mail management	Fair	Good
Off-line functionality	Fair	Good

1 Microsoft Internet Mail uses a preview pane to display message text and lets you open a separate window to view further details. 2 Mail addresses appear underlined and can be added to the address book from a pop-up menu.

client, Internet Mail fills the bill and will cost you nothing.

Microsoft Internet Mail (beta 3). List price: Free. Requires: 386-based PC or better, 4MB RAM, 1MB hard disk space, Microsoft Windows 95 or Windows NT. Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080; fax, 206-936-7329; www.microsoft.com. Circle 506 on reader service card.

Netscape Communications Corp.

Netscape Navigator Gold



Netscape Mail is part of Netscape's \$79 Netscape Navigator Gold 3.0 as well as Netscape's \$49.95 Navigator, not a separate program. But this simple and convenient POP-based mail module handles graphics more effectively than most standalone mail programs, displays the full content of messages without making you open them in a separate window, lets you send a Web page by e-mail, and includes all you need for occasional or low-volume Internet mail.

You normally run Netscape Mail by selecting it from Navigator's Window menu or by clicking on a "mailto" link in a Web page displayed by Navigator. You can run it without opening the Navigator browser first by creating a Windows shortcut with the command line *netscape.exe -mail*.

PC Labs tested the version of Netscape Mail included with Netscape Navigator Gold 3.0, beta 5. The mail window, like the news window, divides into three panes. One contains a list of folders, with the number of total messages and unread messages in each. Another lists messages in the

SUITABILITY TO TASK

Netscape Navigator Gold

	Power	Ease
Installation and setup	Excellent	Fair
Mail creation	Good	Good
Mail management	Poor	Good
Off-line functionality	Fair	Fair

1 With Netscape Mail, you can send a complete Web page to your correspondents. 2 Recipients can view the page as an attachment instead of in-line, which lets them launch the page in Navigator itself

current folder, optionally using a tree-structured display of message threads. The third pane looks like the preview pane in Microsoft Internet Mail and E-Mail Connection but is actually the only message viewer in the program. Unlike programs with preview panes, Netscape Mail does not make you open a new window if you decide you want to see more of the message than the pane displays. A menu lets you choose whether to view attachments in the body of the message or as links to filenames. If you display them as filenames, the names appear in a table with information about the files, and you can display a selected file using the standard Windows viewer by clicking on its name.

You compose messages in a simple editor window where you type in addresses or choose them from an awkwardly designed address book, which doesn't let you add new addresses to the dialog that pops up when you want to select an existing address. You can add addresses only by opening a separate, tree-structured address book window, and you create a mailing list by adding a folder to the tree and dragging icons of individual addresses into the folder.

Netscape Mail's unique ability to send a full Web page lets you "attach" an Internet address from the dialog used to attach files. You type in a URL, and the full contents of the page, including graphics, are added to the message. Of the mail clients PC Labs tested, only Netscape Mail and Internet Chameleon displayed the mailed page; the others either displayed raw text or, like Emissary and Microsoft Internet Mail, tried to run the URL *www.pcmag.com* as a DOS program with a .COM extension!

Netscape Mail can check for new mail at preset intervals, but it doesn't support automated filing rules and won't let you add attachments or graphics by dragging them into the message window. But if Navigator is your browser and you send only a few messages each day, you won't find anything to match Netscape Mail's integration and convenience.

Netscape Navigator Gold 3.0. List price: \$79. Requires: 486-based PC or better, 8MB RAM, 5MB hard disk space, Microsoft Windows 3.1 or later. Netscape Communications Corp., Mountain View, CA; 415-937-3777; fax, 415-528-4124; home .netscape.com. *Circle 499 on reader service card.*

David Harris

Pegasus Mail

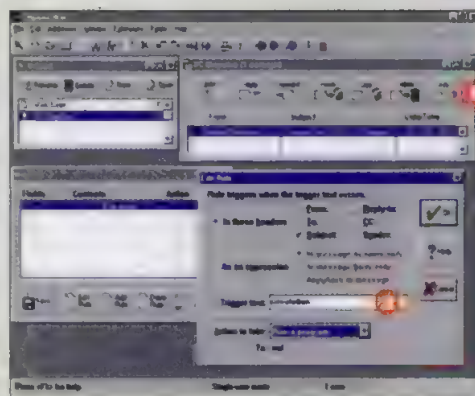
In the best Internet tradition, David Harris's Pegasus Mail 2.4 is its author's free gift to any user willing to brave its complex configuration options and often obscure interface in order to exploit its enormous power. You can pay \$35 for a printed manual, but the program itself is yours for the download.

This POP- and LAN-based mail client, available in both 32- and 16-bit versions, is suited mostly for experts who want advanced features like multiple signature files, built-in access to more than one mail account, and message encryption. Among its unique features are its flexible filing rules that can automatically extract message text to a file, respond to a message by sending a text or binary file, or even run a separate app—and Pegasus Mail can do all this when a folder is opened or closed or independent of any folder operations.

Pegasus Mail can do almost anything with Internet or NetWare-based mail, but you'll have to accept some primitive fea-

headers only, without a preview pane. But when you open a message window, you can jump instantly to the next or previous message via the toolbar or keyboard.

You can add attachments to a message either by dragging them from Windows Explorer into the editing window or by entering the attachments' filenames in an elaborate dialog box that gives you total control over MIME, uuencode, and Bin-Hex options. Fortunately, you can also tell the program to decide for itself how to handle encoding. But you will probably find yourself annoyed with the way Pegasus handles messages with attachments: It forces you to wade through multiple options before you can see anything in the messages themselves. When you double-click on the line that identifies a graphics attachment, a pop-up menu offers to save the attachment as a file, open it as if it were a separate message, view its contents using the standard Windows viewer for the file type, save it to a file and then edit it, or do nothing. If you choose the "quote original message" when you reply to a message with MIME attachments, the at-



SUITABILITY TO TASK Pegasus Mail

	Power	Ease
Installation and setup	Excellent	Good
Mail creation	Excellent	Fair
Mail management	Excellent	Good
Off-line functionality	Excellent	Fair

1 Pegasus Mail can automate everything you want to do with mail. 2 In this dialog box, Pegasus is being set to run a separate program, according to a filter rule applied to a keyword that appears in the message

tures like an editing window that won't reformat paragraphs on the fly but expects you to know the WordStar-like keystroke that reformats on command.

It remembers recently used addresses and lets you select one or more when you create a message; you can also add any recently used address to one or more address books, as well as attach a photograph of the addressee to each entry in an address book. The program stores messages in folders, which in turn are stored in trays. The list of folders shows the number of messages and unread messages in each, and when you open a folder, you see a list of message

attachments go into the reply and you have to remove them by hand.

Pegasus Mail is powerful enough to use as the basis of a corporate mail system, and customizable enough to give individual users unparalleled control over the mail they send and receive. If you prefer power to ease of use, this remarkable program may be your first choice.

Pegasus Mail 2.4. List price: Free; manual, \$35. Requires: 4MB RAM, 2MB hard disk space, Microsoft Windows 3.1 or later. David Harris, Dunedin, New Zealand; *www.pegasus.usa.com*. *Circle 511 on reader service card.*



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Post Road Mailer

Post Road Mailer 2.0, InnoVal Systems Solutions' \$59 POP-based mail client for OS/2 Warp, is currently one of the few Warp mail clients that users can choose from, and the only one that comes with telephone technical support. Among the others is IBM's free, clumsy, and now unsupported UltiMail Lite, which ships in Warp's BonusPack.

Post Road Mailer offers a complex interface with unique conveniences such as sticky notes you can apply to messages you want to remember to follow up on later. It supports multiple mail accounts and searches through multiple messages, complex filing rules, and automated replies, as well as "live" URLs that open in IBM's WebExplorer browser when you click on them. It isn't the last word in elegance or simplicity, but if you want to decide whether to retrieve your messages from the server, get a list of them, or simply find out how many there are, this is the program to choose.

You can adjust the interface to display or hide a toolbar that resembles the Warp LaunchPad and includes buttons for printing messages, managing the print queue, shredding and undeleting messages, and creating a tree-structured filing system. You can also view the messages in your in-box either in a colorful list that uses different colors for the sender's name and the subject field or in a businesslike table that lists arcane details such as each message's POP filename on the server. And keyboard shortcuts in the viewer jump to the next or previous message. Note that although you can open the message in another editor *after* you've opened it in the built-in viewer, you can't make the message open in the other editor.

MIME or uuencoded attachments are indicated by a paper-clip icon, and you have to assign a viewer to each file type in order to view it. When you add a sticky note to an incoming message, a small pushpin icon appears next to the message name, and you can view all messages with sticky notes by choosing Followup from the menu.

Messages are created in an elaborate dialog box with fields in which you can



SUITABILITY TO TASK

Post Road Mailer

	Power	Ease
Installation and setup	Excellent	Fair
Mail creation	Excellent	Fair
Mail management	Good	Good
Off-line functionality	Good	Good

1 Post Road Mailer's interface is overloaded with distracting icons and graphics, but you can reduce some of the clutter. 2 The launchpad at the foot of the screen tells you how many messages are waiting in the in-box and out-box.

specify where to store copies of an outgoing message, which signature file to attach, and whether to encrypt the message or the signature or both. Post Road Mailer may not include a preview pane in its message list, but in almost every other way it equals or surpasses its Windows-based counterparts.

Post Road Mailer 2.0. List price: \$59. Requires: 486-based PC or better, 8MB RAM, 5MB hard disk space, OS/2 Warp. InnoVal Systems Solutions, Harrison, NY; 914-835-3838; fax, 914-835-3857; www.innovat.com. *Circle 512 on reader service card.*

CommTouch Software Inc.

Pronto 96



Pronto 96 is an elegant, up-to-date 32-bit POP-based mail client with a well-chosen set of features and a compact and clear interface. CommTouch Software's \$69 package composes, sends, and organizes messages with minimum effort and maximum efficiency. Pronto 96 lacks useful features like boilerplate message templates, but for most personal and corporate users, its balance between power and ease of use will be close to ideal. All its features can be accessed with one or two keystrokes, or from a space-saving toolbar.

The main window displays a tree-structured folder list and two larger panes, one with a list of messages, the other with the content of the current message and icons for any attachments. If you don't want to waste screen space on the folder tree, Pronto 96 lets you close it and access your mail folders by clicking on

the icons on a Windows 95-style taskbar. When you start dragging a message icon out of a message list to move it into another folder, the folder tree automatically pops up to let you complete the drag-and-drop.

You create messages in an editing window that gives you quick access to multiple address books, complete with nickname aliases and mailing lists. If you add a file attachment by dragging it from Windows Explorer, Pronto 96 pops up a dialog box that asks you for a descriptive name for the attachment and lets you specify the MIME type. The program also supports uuencoding and the new Sun encoding format, as well as attachments.

The message editor includes a microphone icon that lets you record a voice attachment without opening the Windows Recorder. When you receive a message with an attachment, you can double-click on the icon Pronto 96 uses to represent it to view the attachment with the default Windows viewer for its file type, or right-click on the icon to bring up a menu that lets you save the attachment.

Message management rules include automated replies, and although you can set rules that bypass the in-box for incoming messages, you can tell the program to leave a copy of each message in the in-box in addition to moving it. Pronto 96 can search for text in multiple folders and display the results in a convenient list that looks like one of its standard folders. The address book doesn't match the efficiency of the rest of the package: You can't easily select multiple addresses using only the keyboard, and you can create mailing lists only by typing in a list of nicknames by hand, not by selecting them from a menu.

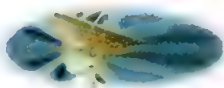
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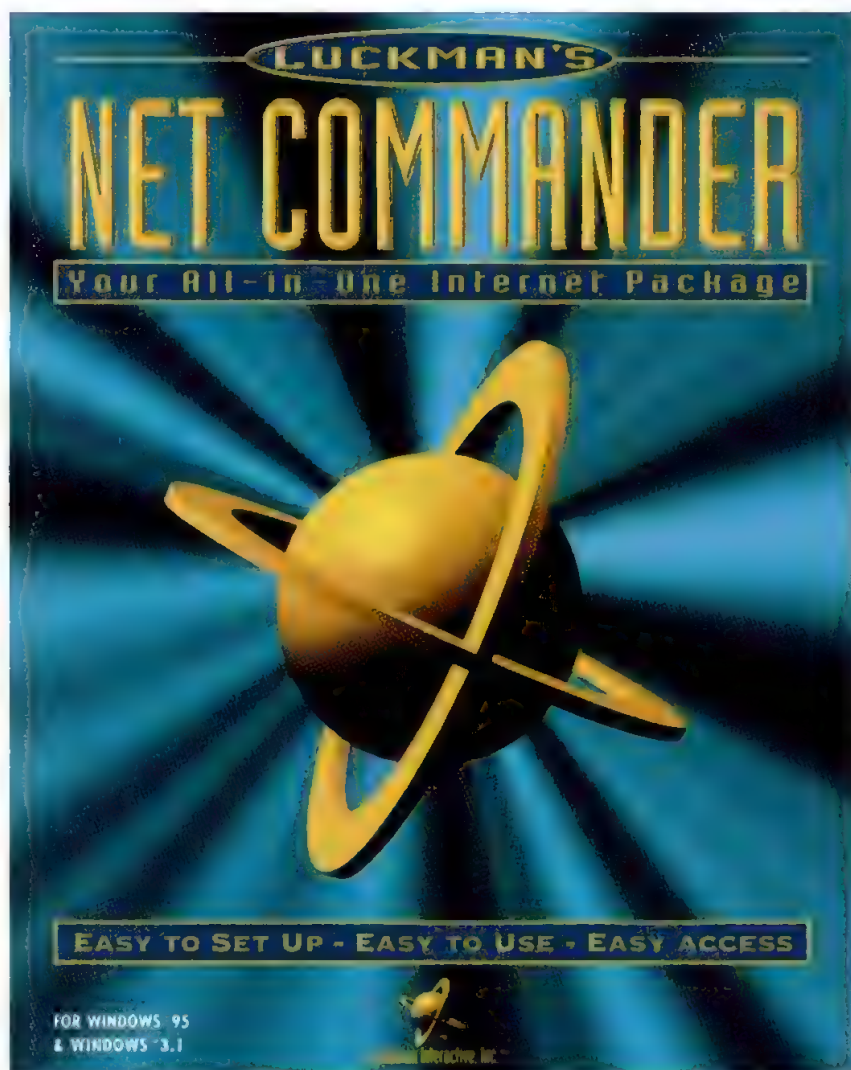
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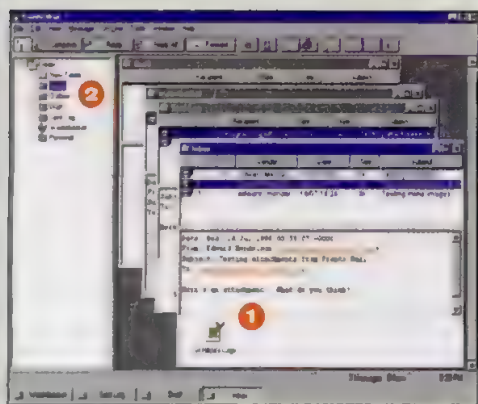
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Internet E-Mail Clients



SUITABILITY TO TASK

Pronto 96

	Power	Ease
Installation and setup	Excellent	Good
Mail creation	Excellent	Excellent
Mail management	Good	Good
Off-line functionality	Good	Excellent

- 1 The efficient interface in Pronto 96 displays attachment icons and text in a single viewing pane visible below the message list.
- 2 If you close the message tree at the left, it opens temporarily to give you a target when you drag a message out of a folder.

to enter mailbox settings, but Pronto 96 doesn't include the multiple-server support built into CommTouch's \$99 Pronto Mobile (still a 16-bit application). Meanwhile, Pronto 96 stands out for its responsiveness, intuitive interface, and impressive range of useful features.

Pronto 96. List price: \$69. Requires: 486-based PC or better, 8MB RAM, 5MB hard disk space, Microsoft Windows 95 or Windows NT. CommTouch Software Inc., Sunnyvale, CA; 800-638-6824, 408-245-8682; fax, 408-245-3466; www.commtouch.com. Circle 513 on reader service card.

Esys Corp.

Simeon

Esys's \$79 Simeon 4.0 (priced lower in quantity) is one of a growing number of Internet Message Access Protocol (IMAP)-based Internet mail systems that runs under Windows. Although Simeon offers more power than the rival IMAP-based package, Embla, it's more complex and awkward than most POP-based mail clients.

Using IMAP, Simeon lets you drag and drop messages between mail servers on two separate networks, or between a server and your hard disk. Unlike Embla, Simeon supports message filing rules that automatically place messages in an ingenious system of virtual subfolders in your in-box on your mail server. But Simeon's interface is difficult to navigate, and important features such as searches through more than one message are entirely absent.

Simeon's configurable interface comprises a tree-structured folder management window and separate windows for

folders on your local machine and on one or more remote servers. You can also create folders for Network News Transfer Protocol (NNTP) newsgroups stored on a corporate server and accessible via IMAP. When you click on a folder name, a window opens with a list of the virtual subfolders it contains, and when you click on the name of a virtual subfolder you see a list of messages. Each virtual subfolder represents a "message service group," which is Simeon's name for a filing rule that displays a message in a specific subfolder if a specified string is found in one of its header fields. Subfolders do not represent any real folders or directories on a hard disk but are merely ways of organizing messages for display in Simeon's window.

To read a message, you click on its title and wait for the contents to be downloaded from the server. When a message contains an attachment, you download each attachment by clicking on its icon and viewing the contents, using the default Windows application for its file type. If you want to store a message or attach-

ment on your local disk, you move or copy it by dragging its icon from the folder that represents the server's in-box to the icon or window that represents one of your local folders. You can't tell Simeon to download messages automatically, but you can set up filing rules that automatically store messages transferred to your local disks in virtual subfolders that can be different from those used for messages on the server.

You compose messages in a simple window that doesn't have direct access to any of Simeon's multiple address books (you add names to the address book by opening it separately from the menu, not from inside the window you use to compose mail). This window can reside locally or on the server and can be shared among users. You can't set a default local address book, but you can specify that one or more address books will be checked for matches when you type part of an address alias in the message-editing window and then click on an Expand Alias button. You add attachments by hand; you can't drag files from Windows Explorer.

Simeon's IMAP technology deserves a better interface, and a version due later this year will search for text in messages on multiple servers, add drag-and-drop, and include other features common in POP-based software. Meanwhile, despite its limitations, Simeon is the first choice for Windows-based IMAP mail. □

Simeon 4.0. List price: \$75. Requires: 386-based PC or better, 8MB RAM, 5MB to 10MB hard disk space, Microsoft Windows 3.1 or later. Esys Corp., Edmonton, Alberta, Canada; 403-424-4922; fax, 403-424-4925; www.esys.ca. Circle 514 on reader service card.



SUITABILITY TO TASK

Simeon

	Power	Ease
Installation and setup	Excellent	Fair
Mail creation	Good	Fair
Mail management	Fair	Fair
Off-line functionality	Good	Excellent

- 1 Simeon's interface relies on a virtual-folder metaphor, in which messages in a single disk-based file are divided into categories on the basis of text found in the headers.
- 2 Any message not sorted by the filter goes into the Main virtual folder.

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I immediately found an ideal viper motif on the [Tattoo Resource Page](#), yet I was curious what [Maximillian's On-Line Tattoo Parlor](#) might suggest — which actually expanded my thinking into the pterodactyl realm. Intrigued, I went on to peruse the [Design Your Own Tattoo Page](#) and — influenced by a well-stenciled midriff from the Bowery on the [History of the Tattoo Web Site](#) — came up with something no one had done before. In fact, everyone on the [Tattoo Talk](#) chat page was going ga-ga over it. So I started thinking tattoos might be my calling, when I scrolled down to a Web site for the [Ministry of the Tattoo](#) in Monterey, where the entire parish is visibly tattooed. Just one potluck dinner and **I ended up finding God.**

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GROUPWARE REACHING FOR THE NET

FUNDAMENTAL CHANGES have been moving through the groupware market. Microsoft's long-awaited Notes killer—Microsoft Exchange Server 4.0—finally arrived, Netscape introduced groupware with an Internet flavor in the form of SuiteSpot, and Lotus shipped the latest generation of its leading groupware system, Lotus Notes Release 4. Novell is also working on a major upgrade to GroupWise, due later this year. Organizations planning to install or switch to a new groupware product will find an enticing mix of standards-based groupware services such as e-mail, group discussion, and scheduling, spiced with Internet integration.

In this roundup, *PC Magazine* reviews three groupware

Internet integration has become essential, but which platform delivers e-mail, messaging and applications development?

By Tony Danahy

products: Lotus Notes Release 4.1, Microsoft Exchange Server 4.0, and Netscape's SuiteSpot. The next version of Novell's popular groupware product, GroupWise 5, is not included in the main roundup because it was not shipping in time (see "GroupWise 5: Messaging Muscle" in this feature). All of the products offer

electronic mail and discussion services. From that point, their architectures quickly diverge.

Notes is a customizable and fully programmable messaging and groupware development system with rich Internet integration. It provides great service but demands savvy administrators. Exchange can tap the development power of Visual Basic, but its strengths

IN THIS REVIEW

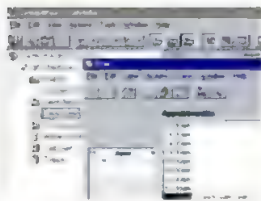
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For updated news and reviews of groupware, visit PC Magazine Online at www.pcmag.com. Join a discussion of Notes and Exchange versus the Web from October 7 to 11 at www.pcmag.com/discuss.htm

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Groupware Feature for Feature

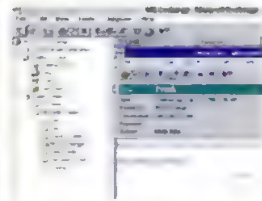
GroupWise 5



Lotus Notes 4.1



Microsoft Exchange Server 4.0



SuiteSpot



E-mail	GroupWise's new interface is extremely easy to use. The program now supports rich text and embedded graphics, and it integrates e-mail, calendaring, faxes, and voice mail into a single in-box.	Notes e-mail offers easy-to-use filtering, word processing, and the Notes File Viewer to display different document formats.	Exchange provides a powerful platform for e-mail, with an intuitive client that can use Microsoft Word as an editor. Outlook, an enhanced client for Exchange, will ship later this year.	SuiteSpot's e-mail is based on open Internet standards. The server supports the advanced IMAP4 standard, but Netscape's own client currently does not.
Directory services	GroupWise's directory services are integrated into Novell's NetWare Directory Services (NDS).	Notes uses a proprietary directory based on its Name and Address Book.	Exchange provides an X.500-compliant directory, which uses administration tools similar to those of Windows NT.	None today. Netscape Directory Server will provide directory services based on LDAP (Lightweight Directory Access Protocol).
Group discussion	GroupWise has basic threaded discussions with no limit on the number of levels.	Notes has classic threaded discussions with no limit on the number of levels, as well as customizable forms. Like any Notes database, a discussion can be replicated for off-line access.	Exchange's public folders have very basic threaded discussion capabilities, limited to four levels. Forms can be customized using the provided Electronic Forms Designer.	SuiteSpot's News Server provides basic newsgroup discussions but does not allow customized forms and has limited integration with other SuiteSpot servers.
Workflow	Novell offers GroupWise Workflow, an add-on program.	Notes' workflow templates are fully programmable, with development features like custom forms and views.	Exchange does not include any workflow features, but third-party workflow products are available.	None, though third-party products for SuiteSpot servers are emerging.
Scheduling	GroupWise offers powerful personal and workgroup scheduling that lets you schedule people and resources.	None, though Lotus expects to have Organizer-like group calendaring and scheduling in Notes 4.5.	Exchange provides Microsoft Schedule+, a robust scheduling program.	None. Internet-based scheduling standards such as ICAP (Internet Calendar Access Protocol) have been proposed.
Document management	GroupWise integrates Novell's SoftSolutions, a powerful document management utility that lets users check documents out, make copies, and track document versions.	Notes supplies some document management functions, such as version control, tracking, and access to third-party document management applications.	None, though Exchange integrates with document management programs from vendors such as PC DOCS and Saros.	None, though third-party products for SuiteSpot servers are emerging from vendors such as Feith Systems and OpenText Corp.
Applications development	Users can create forms and workflow applications using Novell's InForms option for GroupWise. Novell provides a software development kit to develop applications for GroupWise.	The standard Notes client has built-in development tools: the LotusScript scripting language, a macro language, customizable forms and views, graphical Navigators, and Agents for a wide variety of applications.	Exchange's Electronic Forms Designer lets users create basic electronic forms, but for more advanced applications you will have to use Visual Basic or another programming tool.	The Netscape Navigator client has JavaScript support and a plug-in architecture to add functionality. Netscape's servers support CGI, Java, JavaScript, and NSAPI for server-based applications.
Web publishing	GroupWise's WebAccess lets any browser user access a GroupWise in-box.	Lotus's Domino features on-the-fly conversion to HTML and lets browser users read, edit, and create Notes documents.	Microsoft's Exchange Web Access Service, expected by the end of the year, will give browser users read/write access to Exchange data.	SuiteSpot's LiveWire Pro provides Web-based development tools.
Replication	GroupWise provides client-to-server and server-to-server replication down to the document level, but you can't filter what you want to replicate.	Notes provides client-to-server and server-to-server replication, with field-level replication, selection formulas, and the ability to run multiple replication agents on a server.	Exchange provides client-to-server and server-to-server replication down to the document level. Exchange automatically determines the best replication routes.	SuiteSpot's IMAP4 Mail Server lets users selectively download e-mail. SuiteSpot has no cross-service replication manager.

are clearly enterprise-wide e-mail and group scheduling. SuiteSpot, a bundle of Internet servers and other software, is immature as a groupware application platform, although the included Enterprise Server was an Editors' Choice in "Web Servers" (*PC Magazine*, September 10, 1996).

THE GROUPWARE BACKBONE

For all the bells and whistles of groupware, e-mail continues to be the most widely used groupware component. Not surprisingly, both Microsoft and Lotus continue to push the envelope, making mail easier to use and richer in content. Software from Lotus and Microsoft allows users to create messages that include graphics, rich text, and OLE 2.0 embedded objects. Exchange and Notes have directory services that make addressing and routing a matter of pointing and clicking.

Netscape's approach is a different story. SuiteSpot depends on having a number of different servers and clients using open Internet protocols. This is great for Internet champions, but the system needs to evolve. It needs better integration and smoother implementation. Mail Server 2.0, one of the SuiteSpot servers, can use a plethora of Internet protocols, including the advanced IMAP4, but neither Netscape Navigator 2.02 nor the 3.0 client supports IMAP4. (A future version of Navigator, code-named Galileo and scheduled for release by the end of the year, should include support for IMAP4.) Netscape and other vendors of Internet products are releasing new software at a furious rate, and by early 1997 they may provide serious competition for Lotus and Microsoft (for more information, see the sidebar "Internet Messaging").

THE INTERNET

The Internet's phenomenal popularity has created new challenges for groupware vendors. Pressured to give up its stranglehold on proprietary technology for the good of intranet and Internet users, Lotus responded with useful and practical Internet solutions. With Release 4, Notes clients can access the Internet through a

Lotus Notes Release 4.1

What *groupware* means depends on the group that uses it. The best products combine a strong messaging core with a programming environment that can spawn whatever collaborative features the group needs.

Lotus Notes Release 4.1, our Editors' Choice, is such a combination. Notes provides powerful e-mail and excellent tools for creating custom groupware applications. This latest release of Notes has an enhanced client interface and even better development tools than before. Impressively, Notes has held its ground against the rising intranet tide. Lotus's Domino server delivers outstanding Web publishing tools for Notes databases.

Microsoft Exchange Server 4.0 is an excellent platform for enterprise-wide messaging services—but only for Windows NT Server sites. The included forms designer lets even novices create basic groupware applications. More

complex applications require a tool like Microsoft's Visual Basic. In its first release, Exchange's Internet integration is basically limited to e-mail.

Netscape's SuiteSpot in its current version fell short of our expectations.

Several important pieces of SuiteSpot's architecture are planned for release later this year. For now, SuiteSpot is a good choice only for those who require a system based on Internet standards.

Novell's GroupWise 5, in beta version at the time of our review, promises client/server messaging with built-in document management and integration with NetWare Directory Services.



built-in Web browser with nothing more than a click on a URL. And from the outside in, Lotus's new Domino server add-in process lets users of generic Web browsers access Notes databases. Microsoft is working on similar access with its forthcoming Microsoft Exchange Web Access Service, but that product was not available as this issue went to press.

Netscape's SuiteSpot, not surprisingly, offers a collection of Internet servers that users can access through browsers, mail clients, and news readers. ("Building the Perfect In-Box" and "Framing the Discussion," both in this issue, have reviews of mail and news readers, respectively.) What is surprising is the limited integration among SuiteSpot services compared with Notes client services. For example, Notes users can be connected automatically to a Web site with just a click on a URL inserted into a message or document. Little tricks

like these allow people to move about easily among mail, groupware applications, and the Internet. The Netscape Navigator client can obviously handle these standard links, but the Notes client provides a more unified interface than Netscape's separate mail, news, and Web clients.

MOBILITY

Collaboration on the run is becoming less an anomaly and more the norm as users shuttle from home to office to hotel, all the while remaining in the groupware loop. Building on the database replication strengths of previous versions of Notes, Lotus added a powerful replication manager to Release 4, allowing users to customize and optimize remote replication sessions. A new pass-through server feature makes it easier to access multiple servers with a single connection and to move from a networked office to a modem connection from home without losing access capabilities. Microsoft's Remote Access Service (RAS) lets you do much the same, but without the detailed control and session management Notes provides. With

Our Contributors: TONY POMPILI and STEVE RIGNEY are contributing editors of *PC Magazine*. FRANK J. DERFLER, JR., is senior networking editor and TODD SPANGLER is a staff editor at *PC Magazine*. LEON ERLANGER was the senior editor in charge of this story, and BEN Z. GOTTESMAN and LARRY SELTZER were the project leaders.

SuiteSpot, you can download Web pages using a third-party off-line reader and use an IMAP4 mail client to synchronize mail with a remote server—but you need a third-party mail client, since Navigator doesn't speak IMAP yet.

DEVELOPMENT

Development tools are a necessary evil for the vast majority of applications—from workflow systems to discussion templates—that need a little tweaking or have to be created from scratch. Again, Notes leads here. With its own integrated development environment using the Basic-like LotusScript programming language, supplemented by vintage Notes 3.x macro functions and commands, you can modify nearly any element, from views to document forms, in any Notes database, including mail. Microsoft's integrated development environment, built around its familiar Visual Basic programming language, allows you to create complex forms in private and public databases. Microsoft's Electronic Forms Designer isn't as elaborate as the one in Notes, but it is much easier to use.

Netscape's development environment is based on its Navigator Gold Web browser, which lets you create HTML-

formatted pages and supports JavaScript. You can integrate SQL databases by embedding LiveWire Pro Database Library commands in JavaScript. For groupware applications, SuiteSpot is limited to customization of its Web server. Mail and discussions, provided by its Mail Server and News Server, cannot be customized.

BEHIND THE SCENES

Tools for managing and securing enterprise groupware systems have improved over the last year. Exchange and Notes both offer distributed, synchronized directory services. Exchange, not surprisingly, is closely tied to Windows NT Server, which can run on many processors. Lotus, taking a cross-platform approach, has ported Notes to many different combinations of operating systems and processors. The next version of Notes, Release 4.5, promises closer integration with Windows NT Server's directory and management tools. While Netscape doesn't currently offer a directory service, the company is leading a drive toward the Internet-standard LDAP (Lightweight Directory Access Protocol) services, with products expected by the end of the year.

On the security side, Notes, Exchange, and SuiteSpot each offer strong RSA-

based certification. This approach offers a secure method of limiting access to certified users only.

Both Notes and Exchange offer enterprise server administration, allowing you to manage servers from a single client and log-on. SuiteSpot does allow you to manage multiple servers, including mail and HTTP servers—but that's assuming they're all running on the same physical machine. You can still get to any server as long as you don't mind logging on and off each machine.

CHOICES

Your groupware choice comes down to determining which product best fits and enhances your environment. Expect rich groupware feature sets from Exchange and Notes; with SuiteSpot you'll find server and client compatibility with dozens of competing vendors' products. Exchange's integration with Schedule+ makes it a good choice for companies that need to create and view personal and group calendars. Notes provides strong development and customization for integrated mail, workflow, and discussion applications, and its Internet ties have gotten considerably tighter.

GROUPWARE

How to Read the Suitability to Task Boxes

Administration We looked at all the steps involved in getting the groupware system up and running. We evaluated the program's planning tools as well as the server and client installation processes. We examined user management, operating system integration, server monitoring tools, security, and scalability. We also looked at the program's ability to replicate address books and data among servers.

Messaging We focused on the task that is still at the core of these systems: electronic mail. We rated the richness of the mail editor, including the ability to handle multiple fonts, embedded graphics, and attachments. We examined tools for managing mail, such as filters and agents. We also looked at mail from the server's standpoint, including gateways and the method of data storage.

Collaboration Because groupware means different things to different people, we considered just about anything the programs provide for collaboration,

SUITABILITY TO TASK		
Product name	Power	Ease
Administration	Poor	Poor
Messaging	Poor	Poor
Collaboration	Fair	Fair
Internet integration	Fair	Fair
Applications development	Good	Good
Remote access	Excellent	Excellent

including calendars and scheduling, threaded group discussions, workflow, and document management. We also looked at tools for searching across groupware applications and at the integration of other applications to extend the power of the product.

Internet integration We looked at how well the program integrates Internet mail, newsgroups, and the Web. We considered how effectively Web browser users could access the groupware application and what security features were provided. We

also looked at SMTP gateways for Internet mail and NNTP gateways for participating in newsgroups. The product's Internet access capabilities should extend its collaborative features, from the simple ability to launch a Web page from a discussion or e-mail message to tools for publishing on the Web.

Applications development We looked at the capabilities the package provides to extend its functionality, including form and view design as well as programming with a true scripting language and debugging tools. We looked at the program's ability to access data stored in the product's multiple databases along with external data. We also looked at the tools provided for building custom applications.

Remote access We examined the ability to work off-line and synchronize data with servers. Mobile users should be able to access mail and other applications. We looked for good modem support and the ability to use existing remote-access tools.

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Lotus Development Corp.

Lotus Notes Release 4.1



With Lotus Notes Release 4.1, Lotus has not only provided a better user interface, more flexible server configurations, and easier mobile access than in Notes 3.x—it has also directly taken on its biggest competitor: the Internet.

Notes 4, released this year, retains and builds on the fundamental features of its predecessor: a secure, decentralized architecture based on replication, powerful electronic mail, a highly customizable database core with integrated development tools, and built-in support for mobile users. As before, Notes is the best solution for companies that want to design their own discussion, workflow, publishing, and other collaborative applications.

In its most recent release, Notes 4.1, Lotus continues to shore up its leading groupware position, especially in the area of Internet connectivity. With a free download of Domino, Lotus's Web connectivity software for Notes 4.1, users can set up Web sites centered around Notes. Domino provides such thorough access to Notes functions from a Web browser that it earned Notes a higher Suitability to Task rating for Internet integration than Netscape's SuiteSpot, a collection of servers based completely on Internet standards.

From its first release, Notes introduced the concept of a total groupware environment, as opposed to a collection of rigidly defined, independent functions. Notes groupware applications—from workflow applications to discussion databases—are constructed within this environment using common building blocks.

The ability to tweak and develop a database suited to a particular company application is appealing to many groupware administrators. However, for smaller sites with fewer development resources, Notes also supplies a handful of application templates, including a basic item-approval workflow application, document libraries, a room reservation system, and, of course, a discussion database.

The discussion template exemplifies many of the Notes elements. As always, you can set up the database to indent nested discussion messages and associate responses with messages designated as main topics. You can also create a variety of views to sort and organize discussion documents by author, date, subject, and more. Notes 4.1 even lets you sort any column by simply clicking on the heading.

GROUPWARE STARTS WITH A USER

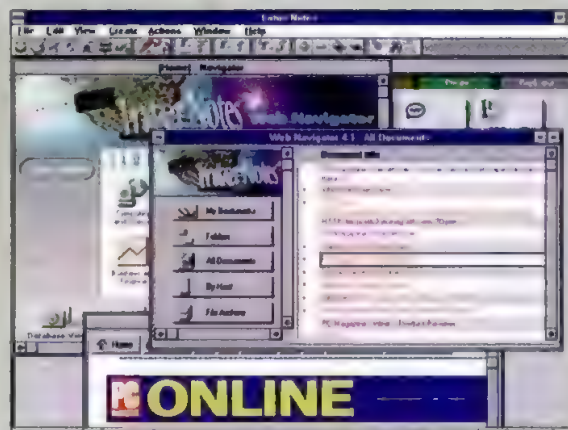
From a user's standpoint, the Notes 4.1 interface is more refined than that of Notes 3.x. Still sporting the tabbed workspace with square icons for databases, Notes now also has a context-sensitive menu bar that makes it easier to locate the program's myriad commands.

Lotus now offers three clients, with varying levels of functionality. Before, Lotus sold only one full-blown Notes client for all users. The full Notes 4.1 client (\$275 list) contains all the fea-

ing. In case you need to send an attachment to a Notes user who doesn't have the application that created it, the Notes File Viewer can preview documents produced by about 50 third-party applications.

A main addition to the Release 4 client is the Replicator. Notes' replication has always let you keep copies of Notes databases on multiple servers. The Replicator is a customizable graphical interface for setting up scheduled and manual background replication sessions. Notes users now can control detailed replication parameters on a database-by-database basis.

The Notes Location Profile feature, new to Notes in Release 4 but found in other packages such as cc:Mail Remote, simplifies the arduous task of switching between configurations. For example, you can define an Office Location, which uses the network and points to your mail on a server, and, for the road, a separate Mobile Location, which uses a modem and database replicas stored on your laptop.



SUITABILITY TO TASK

Lotus Notes

	Power	Ease
Administration	Good	Good
Messaging	Excellent	Excellent
Collaboration	Excellent	Good
Internet integration	Excellent	Good
Applications development	Excellent	Good
Remote access	Excellent	Excellent

Lotus Notes' Web Navigator browser allows users to link to and view Web pages directly from the Notes client by simply clicking on a URL in a message or document.

tures, including applications development tools. For users who don't need the full feature set, there are Notes Desktop (\$69 list), which includes all features minus development tools, and Notes Mail (\$55 list), which provides e-mail and access to databases based on five application templates.

Notes has also received an infusion of new features for creating, viewing, and editing documents. Its word processor-style editor includes features such as automatic numbering, bullets, and permanent pens for marking shared documents. Notes 4.1 supports OLE 2.0, so you can insert documents such as spreadsheets directly into a message and perform in-place edit-

In addition to its control and simplicity, the process of replication, whether from a remote client or among servers, has been streamlined with field-level replication. Instead of replicating entire documents, you can now design a mail file or database to replicate changed fields only. But Notes server-to-server replication connections must be set and changed manually, in contrast with Exchange, which sets up its own server replication connections based on server and network loading. This makes Exchange more flexible and reliable than Notes in situations where a server is down.

Notes 4 also offers an interface option called the Navigator, which makes applica-

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	SUITE SPOT	BACK OFFICE	LOTUS NOTES
Standards-Based Mail, Messaging & Discussion Apps	Yes	Proprietary	Proprietary
Standards-Based Distributed Search & Indexing	Yes	No	Only Via Replication
Server Based Java & JavaScript	Yes	No	No
Native Support For Oracle, Sybase, Informix, & ODBC	Yes	ODBC Only	ODBC Only
Cost w/1,000 Clients	\$11,100	\$170,000	\$277,820

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The Persistence of E-Mail

By Todd Spangler

Our main roundup focuses on Lotus Notes and Microsoft Exchange, two client/server messaging platforms. But simple e-mail is undoubtedly the one collaboration tool people cannot do without. File-sharing e-mail systems often don't receive the same kind of attention that their more advanced client/server siblings do, but many businesses run their critical internal communications on them.

Here's an update on several e-mail products: Lotus cc:Mail, Microsoft Mail Server, ON Technology Corp.'s DaVinci SMTP eMAIL, Banyan Systems' BeyondMail, and SoftArc's FirstClass. These products mainly provide e-mail, but each of them includes options for groupware-like functionality, such as electronic forms and scheduling. In general, though, these packages are not as extensible as Notes or Exchange in terms of their applications development features and are designed for smaller workgroups (with the exception of Banyan's Intelligent Messaging III option).

LOTUS CC:MAIL

Lotus estimates that there are more than 10 million cc:Mail users, making it the most popular e-mail package on the market. The cc:Mail Post Office server software runs on any DOS-compatible operating system. Clients are available for DOS, Macintosh, OS/2, and Windows 3.x; by the time you read this, Lotus plans to have shipped cc:Mail Release 7 with a new 32-bit Windows 95 and Windows NT client.

With Release 6, which shipped earlier this year, Lotus enhanced cc:Mail's Post Office core software, called DB8. Lotus says DB8 routes messages faster, is able to stay online around the clock (previous versions required you to take down the server for some administrative tasks) and supports as many as 1,000 users per server. Release 6 includes a copy of Lotus Organizer 2.1, a personal information manager that can be used as a scheduler, and Lotus Forms, an electronic forms designer.

Release 7 will add support for Microsoft's Messaging API (MAPI) as well as give it the ability to send and receive mail to Notes and POP3 (Post Office Protocol) servers. Release 7 will also include an e-mail threading feature, which provides a link from a response to the corresponding e-mail message in a manner similar to that of Notes. Lotus plans to follow up Release 7 with a version that supports IMAP4 (Internet Message Access Protocol, Version 4). See "Internet Messaging" in this feature story for more on IMAP and POP.

Lotus also sells Notes Mail, an e-mail version of its Notes client that shares the same cc:Mail Release 7 client interface. Lotus positions Notes as the higher-end line, with features cc:Mail lacks, such as an integrated Web browser; cc:Mail supports DOS clients (Notes does not) and is a less expensive solution to implement.

In addition to a slew of gateways to other e-mail systems, including an SMTP (Simple Mail Transfer Protocol) gateway for routing messages to

and from the Internet, Lotus sells cc:Mail for the World Wide Web (server, \$195; ten-user license, \$290). With cc:Mail Web, a user's mailbox and all its functions are accessible from any forms-capable Web browser.

Lotus cc:Mail Release 6. List price: \$195; 10-user license, \$830. Lotus Development Corp., Cambridge, MA; 800-343-5414; www.ccmail.com. *Circle 518 on reader service card.*

MICROSOFT MAIL SERVER

While Microsoft plainly is positioning Exchange as the upgrade path from current Microsoft Mail Server installations, you can still buy the current Version 3.5 of MS Mail Server. Unlike Exchange, with its robust client/server architecture, MS Mail is a basic e-mail system with limited groupware options.

MS Mail runs on any operating system that is compatible with MS-DOS 3.3 or later. Like cc:Mail, MS Mail provides client software for DOS, Macintosh, OS/2, and Windows 3.x.

Several add-on options are available for MS Mail, including a remote-access client, a fax gateway, gateways to other e-mail systems (including one for SMTP), and Microsoft Schedule+ for Windows, a calendar program.

Microsoft Mail Server 3.5. Street price: \$469; 5-user license, \$269. Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com. *Circle 519 on reader service card.*

DAVINCI SMTP EMAIL

Version 4.1 of ON Technology's DaVinci SMTP eMAIL package for

tions easier to work with. Graphical and Web page-like, Navigators can display graphics, such as icons or logos, that are linked to Notes documents or views.

BUILD YOUR OWN GROUPWARE

For developers, Lotus has supplemented its macro language with LotusScript, an object-oriented Basic-like language that supports Notes manipulation calls. LotusScript can also be found in Lotus's

WordPro and Approach, and the company plans to incorporate it into all of its SmartSuite products. For users, Lotus has beefed up its macros, called Agents. Agents make it easier to create rules-based tasks that can, for example, reply to messages automatically while you're on vacation. These robots can do a variety of workflow-type tasks, such as marking outdated or overdue documents for action.

SERVING IT UP

On the server side, Notes is making it easier for large and small sites to lay down an infrastructure for workgroup applications. Notes servers support symmetric multiprocessing and full 32-bit code. Depending on server configuration, Notes 4.1 servers can handle up to ten times Notes 3.x's limit of 80 to 110 active users per server. A pass-through feature, new in Release 4, makes it possible for dial-up

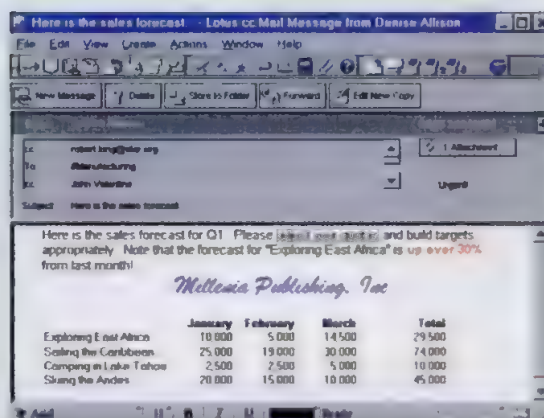
NetWare, released earlier this year, includes a built-in SMTP gateway and POP3 server for routing e-mail from the LAN across the Internet. DaVinci is best suited for NetWare-and-Windows shops: Unlike cc:Mail or MS Mail, DaVinci is available only as a NetWare Loadable Module (NLM), and DaVinci clients are available only for Windows 3.x, Windows 95, and Windows NT Workstation. Also, DaVinci does not have any groupware-like capabilities for forms or scheduling. ON Technology sells a separate product, Meeting Maker XP, for group scheduling. Unlike previous versions, DaVinci 4.1 no longer requires Novell's Message Handling System (MHS).

The DaVinci SMTP eMAIL NLM integrates with NetWare Directory Services (NDS) in NetWare 4.1 or the NetWare 3.x Bindery, which lets you use your current list of NetWare users with the DaVinci mail system.

DaVinci SMTP eMAIL. List price: \$999; 10-user license, \$850. ON Technology Corp., Cambridge, MA; 800-767-6683; www.on.com. Circle 520 on reader service card.

BEYONDMAIL

Banyan Systems is best known for its VINES network operating system and for its powerful StreetTalk global directory service (for more information, see "The NOS Evolved," *PC Magazine*, May 28, 1996). BeyondMail is the company's front-end e-mail software that works with either VINES or NetWare messaging services. Clients



The new 32-bit cc:Mail Release 7 client for Windows 95 has the same interface as the Lotus Notes Mail client.

are available for Macintosh, Unix, and Windows 3.x systems. Banyan's Internet division, Coordinate.com, recently announced BeyondMail 3.0 Internet Edition, an SMTP and POP3 client for Windows that will support the LDAP (Lightweight Directory Access Protocol) standard.

BeyondMail running with Banyan's Intelligent Messaging III messaging service and StreetTalk is a potentially powerful solution for enterprise-wide e-mail. Intelligent Messaging provides features such as least-cost routing and compression, which are important when sending e-mail over WAN links.

Banyan also sells BeyondMail for MHS, which requires Novell's Message Handling System or an MHS-compatible mail system. BeyondMail for MHS does not support NDS, so companies running primarily NetWare 4.1 will find DaVinci or Novell's GroupWise more suitable.

Mail Transport Agents for other e-mail systems, including SMTP, X.400, and cc:Mail.

Lotus has consolidated several important server administration functions into a new Administration application. From a single screen, you can choose any of your organization's servers, view address books, create Notes IDs, and test mail routing. For user administration, Notes remains independent of the operating system, unlike Ex-

BeyondMail. List price: \$85 per user (Intelligent Messaging version). Banyan Systems Inc., Westboro, MA; 800-222-6926; www.banyan.com. Circle 521 on reader service card.

FIRSTCLASS

SoftArc's FirstClass is designed for departmental e-mail, electronic forms processing, group discussions, and real-time chat over both LAN and dial-up connections. Developed first for Macintosh servers,

FirstClass also runs on Windows NT Server, with clients available for Windows 3.x and Macintosh. This fall SoftArc plans to ship version 3.5, which includes a 32-bit Windows 95 and Windows NT client.

Enhancements in the new version include client-side replication for the capability to work off-line, an upgraded Client Extensions Toolkit to let you query SQL and ODBC databases from a FirstClass e-mail client, and improved directory synchronization. With version 3.5, SoftArc also introduces the FirstClass Gateway for SMTP/NNTP (\$495) and a new DOS client. The company has announced plans for FirstClass 4, which will add Internet publishing features.

FirstClass. List price: 5-user license, \$495 (Windows NT version). SoftArc Inc., Markham, Ontario, Canada; 800-763-8272; www.softarc.com. Circle 522 on reader service card.

users to access multiple Notes servers with a single phone call.

Mail runs more efficiently, too, with the new shared mail option, which Lotus calls Single Object Copy Storage. Like file-sharing message stores, Notes can now store a single copy of a message in a public database. Although new to Notes, this feature has been available in Microsoft's messaging products for some time. Notes continues to support a variety of gateways and

change, which lets you add new Exchange users when creating Windows NT user accounts. However, Notes Release 4.5, expected to ship this fall, will offer integrated Notes and Windows NT user administration features, among other enhancements.

THE REST OF THE WORLD

Notes 4 allows users to access the Internet via a Notes server using the Web Navigator, a built-in Web browser. Selecting

GroupWise 5: Messaging Muscle

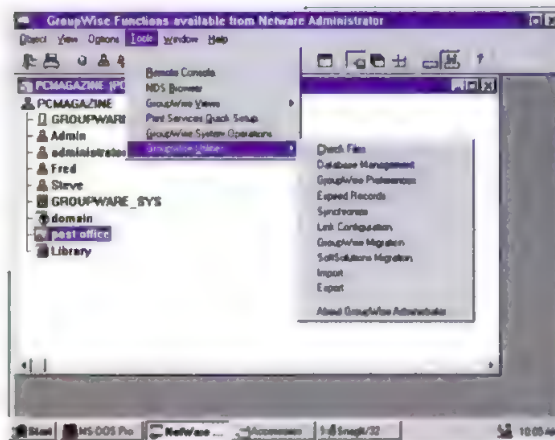
By Steve Rigney

Novell's revision of its messaging product, GroupWise 5 (formerly known as GroupWise XTD), was not available at the time of our testing. We couldn't review the finished product, scheduled for September release, but we took a look at the beta version. The new GroupWise breaks with its previous file-sharing architecture, offering a strong client/server e-mail solution with built-in document management and scheduling.

GroupWise 5 should be a viable option for basic groupware applications, especially for NetWare networks. Novell has not announced pricing, but says GroupWise will be priced per user instead of per server as before. Although it's not the easiest platform for creating custom groupware applications, you can customize the product with third-party programming tools and the optional electronic forms package.

Like Exchange, GroupWise 5 provides excellent client/server messaging and strong scheduling features, but GroupWise goes further, with powerful document management and the ability to run on NetWare as well as Windows NT Server. But GroupWise lacks the strong applications development and field-level replication capabilities of Notes.

Before installing GroupWise 5, you must first update several files on your NetWare 4.x server and client PCs. While the GroupWise server will run on Windows NT and earlier versions of NetWare, it relies on NetWare 4.x's NetWare Directory Services (NDS) for security and administration. This means that you need to have a NetWare 4.x server somewhere on your network. Fortunately, Novell plans to bundle a runtime version of NetWare 4.1 with GroupWise. The product includes client software for Windows 3.x, Windows 95, and Windows NT. A



Novell's NWAdmin lets you manage all of your GroupWise resources, in addition to NDS servers and users.

Macintosh client will ship later; however, DOS and OS/2 clients will not be supported.

A MAILBOX AND MORE

GroupWise's client interface is similar to that of Exchange. All of a user's information, including e-mail, public folders, documents, and schedules, are nested in a Windows 95 Explorer-like menu system. When you click on a folder on the left side of the screen, its contents appear on the right. As in Notes 4.1, you can customize the interface with a viewer at the bottom of the screen, to show you the text in a selected message.

New in this release, the GroupWise client will support rich text and OLE embedding. GroupWise provides a single in-box that can hold e-mail messages, faxes, voice mail, and calendar items. In fact, GroupWise looks at each of these objects as a message. GroupWise also offers message tracking, which determines whether a message has been received or read, or if it needs to be resent.

GroupWise lets you set up useful rules for sending and receiving messages. For example, you can easily define how to handle your e-mail when you are on vacation: You can choose to forward certain messages,

delete them, or send a standard reply. The product also has an easy-to-use form for creating rules, and you can create and save as many as you need. Unfortunately, you cannot schedule times to run rules—they're either on or off.

NETWORK INTEGRATION

All of the GroupWise administration and management tasks are tied to NetWare 4.x's NWAdmin utility. GroupWise 5 will ship with a new 32-bit

version of NWAdmin that lets you configure your GroupWise users and resources. When you create a new NetWare user, you can simultaneously create a new GroupWise user, a relationship similar to that of Windows NT and Exchange. NWAdmin can import user names and security from NDS, Bindery, or a text file. The program also provides the same detailed levels of security as NetWare 4.x and allows you to restrict access to individual files and folders.

Because GroupWise relies on NDS for management, it is easy to administer all of your servers from a single location. GroupWise also allows you to replicate information among servers, but like Exchange, it doesn't provide field-level replication, whereas Notes does.

GroupWise doesn't provide Web publishing capability, as Lotus's Domino server does, but Novell offers GroupWise WebAccess (five-user license, \$75), which gives Web browser users access to their GroupWise mailboxes. By using WebAccess, remote users can send and receive messages from any Internet connection.

The GroupWise Asynch Gateway allows you to dial in from the road and completely replicate data

between your client PC and the server. Remote users access GroupWise using the same client software as LAN-connected users.

A unique feature of GroupWise 5 is its built-in document management, previously sold separately as Soft-Solutions. You can create a public document and post it into a shared folder for users to check out and in at their convenience. The network administrator can monitor statistics of each document, including how many versions of the document exist, who has it open, and when it was last changed. This is a great feature for businesses in which several users or departments are involved in the creation of large documents.

You create threaded discussions by posting a message in a public folder and using the Conversation view to display it. Unlike Exchange, GroupWise does not limit the number of levels to which the thread can extend. Unfortunately, you cannot moderate the discussion group. You can create a discussion using almost any message type, including e-mail, schedules, and tasks.

GroupWise's scheduling utility offers many of the same capabilities as Microsoft Schedule+ and is as easy to use and navigate. In addition to scheduling people for group meetings, you can also schedule resources, such as a conference room.

GroupWise sells separately an electronic forms designer called InForms with Designers and Fillers (five-user license, \$495). Novell will also separately sell a workflow utility called GroupWise Workflow, for which pricing was not available. If you want to write your own groupware applications, you will have to use the Novell Software Development Kit (SDK) and a third-party programming tool.

GroupWise 5. List price: Not yet announced. Novell Inc., Orem, UT; 800-638-9273; www.novell.com. Circle 523 on reader service card.

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the built-in browser lets you enter a URL and automatically connects you to the Web site. Notes 4.5 will provide native TCP/IP support for any third-party browser. You can also program Notes Agents to download specified pages on the Web and store them on the Notes server at intervals you define.

Another handy feature is the URL parser, which identifies URLs in document text and creates links to their sites. Clicking on the URL launches the browser and connects to the site. Also, developers can write

Internet-aware applications using commands such as URLOpen to bring up a Web site from within Notes automatically.

One of the most exciting additions to Notes lets you make your Notes databases available to any Web user. Called Domino, the free Notes server add-in process takes any Notes database and converts documents to HTML. Web browser users then connect to the Domino Web server using a URL. Unlike its predecessor, InterNotes Web Publisher 4.0, Domino retrieves data on the fly, so Web users get

the same information as Notes users.

Domino doesn't limit you to reading documents. It also lets you create, edit, and delete, so you can run nearly any Notes groupware application, with a few interface modifications, on the Web. When you combine Domino with Notes' workflow capabilities, you have a very powerful Web site creation platform for a large organization.

Domino also takes advantage of Notes' powerful database-level security access. Notes administrators can set de-

Exchange Gets a Whole New Outlook

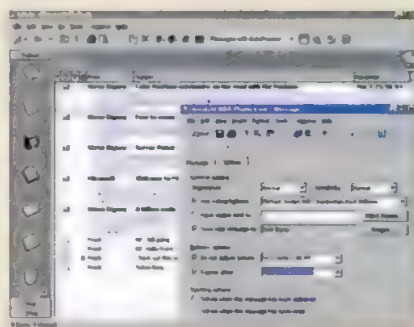
By Ben Z. Gottesman

After much anticipation, Microsoft finally shipped its Exchange Server earlier this year. Combined with the updated client and Schedule+, Exchange offers a robust e-mail system that treads lightly into the world of groupware (see the review in the main roundup). By the end of this year, however, Microsoft plans to release Outlook, a new client that will combine and extend the mail features of Exchange as well as give users more sophisticated contact management and scheduling than Schedule+ provides.

Outlook will let users customize forms and views more easily to build groupware applications that further take advantage of the power of Exchange Server. The program also integrates with the Windows 95 Explorer, so users can navigate through local and network drives from the same interface.

The 32-bit Outlook, which will run under Windows 95 and Windows NT, will be sold in a few different ways: as part of the forthcoming Microsoft Office 97 (where it will replace Schedule+), as an optional client for Microsoft Exchange Server, and as a standalone product. Microsoft has no plans to deliver Outlook for Windows 3.x or non-Windows environments. Like the Exchange client, Outlook can act as a universal in-box to any MAPI information service.

Within a single front end, Outlook gives users quick access to all facets of



Outlook's new features include AutoPreview, which lets you see the first few lines of new mail messages.

the program. Outlook replaces the Exchange client's hierarchical listing of private and public folders with sliding groups of icons similar to the Shortcut Bar in Microsoft Office for Windows 95. By default, three groups are shown: Outlook, Mail, and Other. Within the Outlook group are the user's Inbox, Calendar, Contacts, Tasks, Journal, and Notes. The Mail group includes the Outbox, Sent Items, and Deleted Items. The Other group shows My Computer and the Favorites folder. Users can add items to any of the existing groups or add new groups.

FLUENT IN FORMS

One of the most exciting features of Outlook is the new forms designer. Users can customize any of the default forms or create their own. The new designer is integrated into the application and is more powerful and intuitive

than the Exchange Forms Designer. The Outlook forms designer includes Field Chooser, which lets users select fields from a convenient list grouped by type, and AutoLayout, which automatically aligns fields you drag onto a form. You can store customized forms in the Exchange public forms directory or the user's personal forms directory, or you can use them as one-time forms.

Outlook significantly enhances Exchange's mail tools. Users can now recall unread messages, a useful tool for pulling back messages sent in error, set up voting buttons on messages and compile the results, and automatically direct replies to a different recipient. In general, Outlook will be able to interoperate with Exchange, but some of the new features, such as voting and custom forms, require the Outlook client at all ends.

Virtually all of Outlook's group features, such as scheduling and shared folders, require Exchange Server. Even synchronization between a desktop system and a notebook will require Exchange. But Outlook still looks to be a strong contender in what Microsoft calls the "desktop information management" market against products such as Lotus Organizer, NetManage's ECCO Pro, and Symantec's ACT!

Outlook will not make Exchange as rich a groupware environment as Lotus Notes. Still, its all-in-one interface, rich off-the-shelf tools, and end-user customizability will make Exchange a more appealing platform.

tailed access rights to databases, including restrictions on views, forms, documents, and even fields. Domino's security piggybacks on this architecture to make it possible to control Web access with similar precision. A separate product, Lotus InterNotes News (\$2,199 list), lets you convert newsgroups into Notes databases and post responses from a Notes client.

Best of all, at least for the price-conscious, Domino is free to anyone with a Notes Release 4 server and will be bundled with Notes 4.5. This is consistent with Lotus's attempt to market a leaner, meaner, and cheaper Notes. Client licenses are now priced as low as \$55 per user—a far cry from the original \$495.

Lotus plans to take Notes even further. Notes 4.5 is expected to feature shared calendars and scheduling, like Lotus's Organizer. It will also include automated Web access features to perform tasks such as checking URL sites in the background and notifying users if a site's content has been updated.

—Tony Pompili

Lotus Notes Release 4.1. List price: Server, single-processor version, \$495; server, multiprocessor version, \$2,295; client, \$55 to \$275. Lotus Development Corp., Cambridge, MA; 800-346-1305, 617-577-8500; www.lotus.com. *Circle 515 on reader service card.*

Microsoft Corp.

Microsoft Exchange Server 4.0

If your organization needs powerful client/server messaging with integrated group scheduling and discussion—and you're willing to run your entire messaging platform on Windows NT Server—Microsoft Exchange Server 4.0 is an excellent solution. Exchange Server offers easy installation; configuration, administration, and management that are well integrated with Windows NT Server; and a flexible, intuitive mail client. Exchange also provides the Microsoft Exchange Forms Designer, which lets practically anyone create simple groupware applications; add Visual Basic or a third-party programming tool and your groupware applications can be even more powerful and complex.

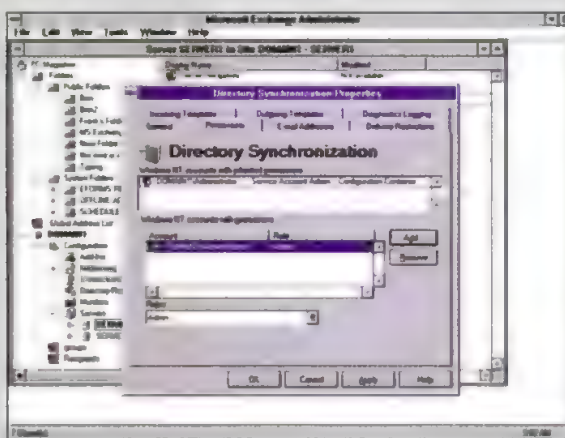
Exchange is primarily a messaging platform, however. If your needs lean more toward a flexible and powerful groupware programming environment right out of the box and you want to run your groupware on multiple server platforms, you're better off with Lotus Notes Release 4.1.

For now, Notes also beats Exchange when it comes to Internet integration. At the time of this review, Exchange Server did not provide Web browser access, as Notes 4.1 does with Domino. The only Internet connectivity features Exchange currently offers are support for TCP/IP, an SMTP/MIME gateway that lets you

includes several worksheets to help you plan your network. Microsoft provides a separate site-planning modeling tool and a load simulator, available free from the Microsoft Web site or on an extra CD.

Because Exchange is tied closely to Windows NT Server, it is extremely simple to import all of your network user names and security from the operating system. You can set up new Windows NT Server and Exchange users in one step, and then use Windows NT Server management tools such as Event Viewer to manage Exchange.

Exchange is also the only product in



SUITABILITY TO TASK

Microsoft Exchange Server

	Power	Ease
Administration	Good	Excellent
Messaging	Excellent	Excellent
Collaboration	Good	Good
Internet integration	Poor	Good
Applications development	Good	Fair
Remote access	Good	Good

Exchange lets you decide what information to replicate among servers and what time you want the transfer to take place.

send e-mail over the Internet, and the ability to click on URLs in messages and automatically launch a Web browser. By the end of the year, Microsoft plans to offer the Microsoft Exchange Web Access Service, which will give Web browser users read/write access to Microsoft Exchange server data.

In future releases, Microsoft Exchange public folders will accept NNTP news feeds and provide access to NNTP clients. Microsoft also plans to support the Lightweight Directory Access Protocol (LDAP), letting LDAP-compatible e-mail clients access the Exchange Server directory, and IMAP4, giving compatible clients access to Exchange Server.

EASY INSTALL

Microsoft has made Exchange Server a snap to install. The only information you have to supply during the installation is the name of your Windows NT Server and the name of your new or existing Exchange site. If you are installing Exchange on a large enterprise network, the package

this review that includes a 24-hour-a-day, seven-day-a-week backup utility that will protect all of your messages and your database index (though third-party tools are available for the other programs). This utility can back up all the Exchange Servers in an organization from a single location while the servers remain online.

UNIVERSAL IN-BOX

The client that comes with Exchange Server is not the same as the Microsoft Exchange Inbox for Windows 95, which cannot access Exchange Server. Like GroupWise, Exchange Server's client features a universal in-box that provides access to e-mail messages, faxes, forms, and meeting requests in a single view. It also lets you receive your Internet, Microsoft Mail, and CompuServe messages in the same in-box.

By the end of this year, Microsoft plans to release Outlook, a new client for Windows 95 and Windows NT that should enhance Exchange Server's mes-

Put

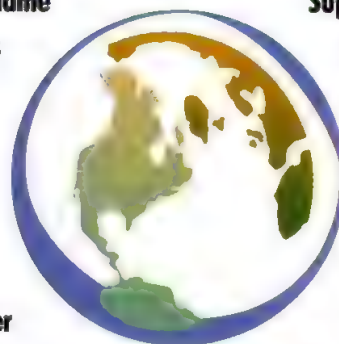
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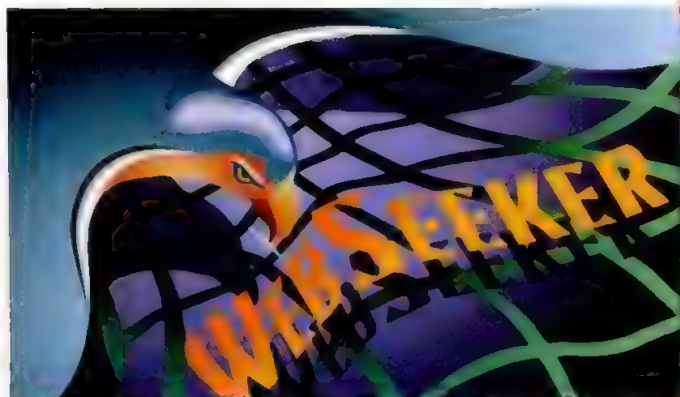
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SUMMARY OF FEATURES

Groupware

Continues



■ YES ■ NO □ OPTIONAL

Products listed in alphabetical order

GroupWise 5
(beta version)

Lotus Notes
Release 4.1

Microsoft
Exchange
Server 4.0

SuiteSpot¹

E-Mail

Single in-box view can include:

E-mail/Voice mail/Faxes

Calendar events

Message content:

Rich text/Graphics/Forms

OLE 2.0

Clickable hypertext/URL links

Forms can be customized by
administrator/user

User can set client-server-based rules for:

Incoming messages

Outgoing messages

Messages in other databases

User can delegate access to a private
mailbox

User can view delivery route

Group Discussion

Number of levels allowed in threaded
discussions

OLE support

Types of searches:

Boolean

By database/topic/full text

Across multiple databases

Agents can be created to search for specific
topics

Moderated discussions/Message tracking

Other Integrated Functions

Workflow:

Sequential/parallel flows

Author tracking

Saving of defined workflows

Scheduling/Project management

Document management:

Check-in/Check-out

Concurrency control/Versioning

Internet access through a proprietary/generic
browser

Administration and Applications

Administration from server console/client/
remote client

Administration of multiple servers from a
single site

Administrator can:

Assign rights to individual databases and
mailboxes

Assign rights to individual files/fields

Assign multiple levels of access rights

Restrict Web access

Monitors links to other servers

Management integrated with the NOS's
directory services

Integrates with Windows NT Server's
performance monitor/event viewer

SNMP agent included

Field-level encryption/Digital signatures

Supports X.509 encryption standard

Transaction rollback/Single-instance storage

(1) Including a beta version of Netscape Mail Server 2.0

saging functions (for details, see the sidebar "Exchange Gets a Whole New Outlook").

The current Exchange client interface, like that of GroupWise, consists of a two-paneled view of the mail environment. The left pane shows a Windows 95 Explorer-like list of the user's personal, private, and public folders. Personal folders contain messages the user does not want anyone else to see. Private folders can contain either the user's own messages or messages accessible to only a specified list of users. Public folders contain documents and messages that can be shared by multiple users and groups across the organization.

The right pane displays a list of the messages contained in the folders selected in the left pane. You can easily create customized message views and sort messages by date, author, subject, and other categories simply by clicking on column heads. The interface makes it easy to create rich text messages with binary attachments, embedded graphics and illustrations, and embedded OLE 2.0 objects.

Exchange goes beyond traditional e-mail, letting users set up complex rules for handling message replies, forwards, workflow, and more. Rules can automatically file incoming mail, filter out unwanted mail, or forward messages based on a particular subject to other users.

If you already use another e-mail solution, Exchange offers connectors that allow you to send and receive messages with users on the other server. For example, Exchange includes a Microsoft Mail connector that makes it easy to send electronic messages with an existing Microsoft Mail post office. Exchange also includes SMTP, X.400, MAPI, and other e-mail gateways.

Collaborative tasks are performed in Exchange using public folders and electronic forms. Messages in public folders can be viewed several ways. Choosing the view called "Group by Discussion Topic" arranges messages under subjects and by threads of responses and responses to responses—similar to Notes' group discussions. Unlike Notes, however, which has unlimited levels of responses, Exchange allows only four levels.

For creating simple workflow or other applications, Exchange includes a

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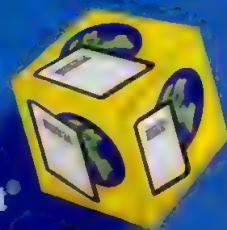
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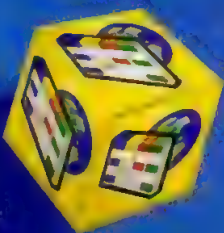
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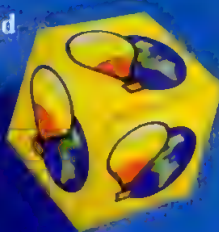
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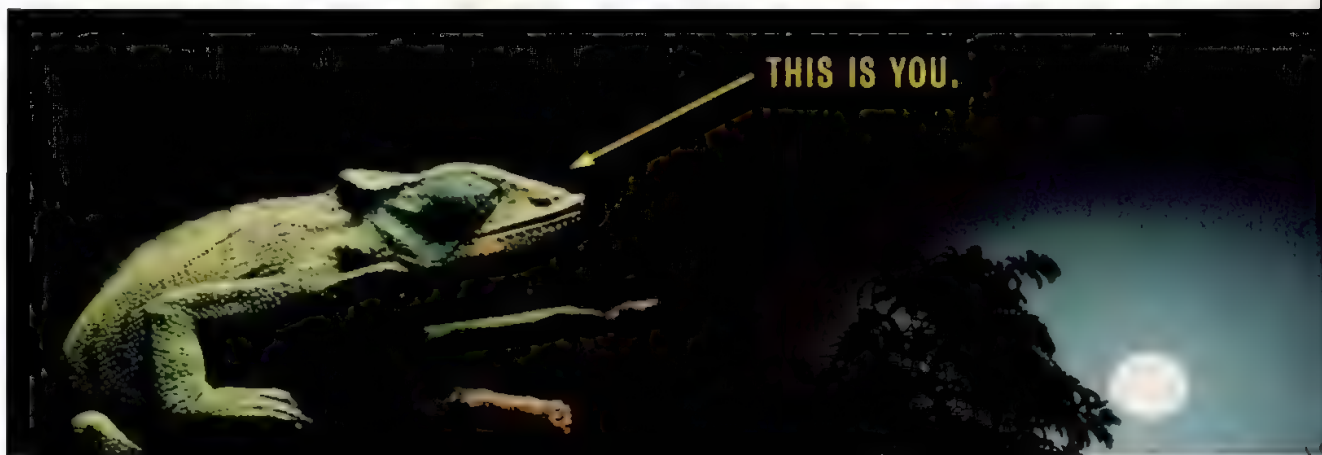
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SUMMARY OF FEATURES					
Groupware					
■ YES ■ NO □ OPTIONAL Products listed in alphabetical order PC MAGAZINE EDITOR'S CHOICE GroupWise 5 (beta version) Lotus Notes Release 4.1 Microsoft Exchange Server 4.0 SuiteSpot¹					
Replication					
Automatic backup/incremental backup	■	■	■	■	■
Server-transparent database access	■	■	■	■	■
Integrated forms designer	■	■	■	■	■
Full development environment	■	■	■	■	■
APIs supported:					
MAP/VM/CMC	■	■	■	■	■
ODBC/OLE 2.0	■	■	■	■	■
TAPI/TSAPI	■	■	■	■	■
Bidirectional replication between servers	■	■	■	■	■
Background replication	■	■	■	■	■
Folder/document/field-level replication	■	■	■	■	■
Replication to remote client	■	■	■	■	■
Replication can be scheduled	■	■	■	■	■
Internet Features					
Web server	□	■ ²	□	■	■
Web server access control via password/domain/IP address	■	■ ² ■ ² ■ ²	■	■	■
On-the-fly translation of messages to HTML	■	■ ²	■	■	■
Web-browser client can:					
Access in-box/Send e-mail	□	■ ² ■ ²	■	■	■
Access other databases/folders	□	■ ² ■ ²	■	■	■
Respond to group discussions	□	■ ²	■	■	■
Make attachments to a message	□	■ ²	■	■	■
Search messages/attachments	□	■ ² ■ ²	■	■	■
User can launch URLs from message documents	■	■	■	■	■
Web documents can be cached on a server	■	■	■	■	■
HTML documents can be published from a native database	■	■	■	■	■
Supports NNTP/SMTP/X.400	□	■	■	■	■
Supports MIME/Unicode	□	■	■	■	■
User can browse HTML documents while disconnected	■	■	□	■	■
Client Operating Systems Supported					
Windows 95/3.11/NT Workstation 3.51	■	■	■	■	■
DOS 6.0	■	■	■	■	■
Mac OS, OS/2 Warp	■	■	■	■	■
ADX (version)	■	■ (4.1.3, 4.1.4)	■	■ (3.25, 4.x)	■
HP-UX (version)	■	■ (10.01)	■	■ (9.x, 10.x)	■
Server Operating Systems Supported					
Windows NT Server 3.51 or later	■	■	■	■	■
NetWare	■ (3.x and higher)	■ (3.12, 4.1)	■	■	■
Sun Solaris	■	■ (2.4, 2.5, 2.51)	■	■ (2.4, 2.5)	■
SCO OpenServer	■	■	■	■	■
HP-UX	■	■ (10.01)	■	■ (9.x, 10.x)	■
ADX	■	■ (4.1.3, 4.1.4)	■	■ (3.25, 4.x)	■
OS/2 Warp Server	■	■	■	■	■
Protocols Supported					
IPX/SPX	■	■	■	■	■
TCP/IP	■	■	■	■	■
NetBIOS and NetBEUI	■	■	■	■	■
VINES	■	■	■	■	■
Migration Tools					
cc:Mail/GroupWise	■	■	■	■	■
Microsoft Mail/Lotus Notes 3	■	■	■	■	■
PROFS	■	■	■	■	■

(1) Including a beta version of Netscape Mail Server 2.0.

(2) This feature is free to download from the vendor's Web site.

separate application called the Microsoft Exchange Forms Designer. The Exchange Forms Designer provides a set of graphical tools and wizards that guide the user through the application creation process. It automatically generates the code to run the form and installs the form in a public or private Exchange folder, or in the Forms registry, which lets you use the same form in multiple applications. For more complex applications, Visual Basic or a third-party tool is required.

Exchange offers first-rate, easy-to-use network scheduling features. Microsoft Schedule+ allows you to keep track of network users' schedules. Some of the powerful features of Schedule+ include resource scheduling, automatic meeting notification, and conflict resolution. GroupWise offers similar scheduling capabilities. Notes currently lacks network scheduling, but Lotus plans to include it in the next release.

REPLICATION

Exchange, like Notes, allows you to replicate information between client and server and among servers. But Exchange provides replication only down to the document level, and it doesn't let you filter the information you want to replicate. While Notes' field-level replication sends only selected fields in a document, Exchange's document-level replication has to send the entire document. This difference will become an issue especially if you are replicating large documents or forms over a busy or slow network connection. Unlike Notes, Exchange continually sets up its own server replication connections based on server and network loading. This makes Exchange more flexible than Notes—which requires these connections to be set up manually—in the event that a server is down.

Unlike Notes and GroupWise, Exchange doesn't provide a proprietary remote dial-in utility, but the product works closely with Windows NT's built-in Remote Access Service (RAS) or other remote-node products.—*Steve Rigney*

Microsoft Exchange Server 4.0. Street price: \$529, plus \$54 per user license. Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com. *Circle 516 on reader service card.*

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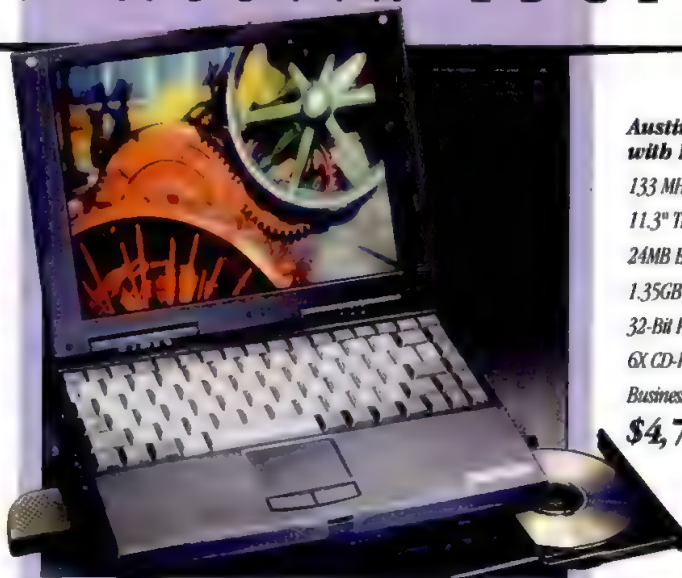
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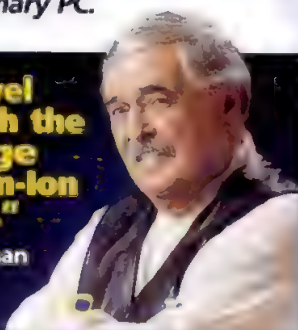
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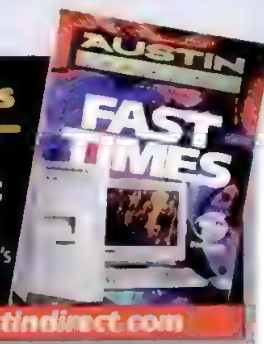
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Netscape Communications Corp.

SuiteSpot

Netscape, the company that has made its name almost synonymous with the Internet, is attempting to achieve similar status with groupware. SuiteSpot, the company's first groupware product, promised to deliver an environment for mail, discussion, and applications development competitive with Lotus Notes. But for now, SuiteSpot misses the mark for all but those intent on running only services based on Internet standards.

SuiteSpot (\$3,995 list) is a cornucopia of Netscape servers and software that includes the Navigator Gold client, the Enterprise Server Web server, a mail server, and a news server for newsgroup discussions. This approach differs from that of Exchange and Notes, which use integrated server software for their mail, discussion, and workflow environments. The SuiteSpot servers lack the cohesiveness of a more mature groupware platform like Notes.

Netscape's future offerings will fill in some of the architectural shortcomings of SuiteSpot. The Directory Server, to be released by year end, will provide directory services based on the Lightweight Directory Access Protocol (LDAP), giving users a centralized directory service.

Also expected later this year is the Catalog Server, designed to provide a searchable, Yahoo-like catalog of internal and external data. For secure certification, Netscape will ship later this year its Certificate Server, based on the X.509 certificate standard. The next release of the News Server will incorporate elements of Collabra Share, the group discussion software that Netscape acquired last year. Finally, Netscape recently announced its Open Network Environment (ONE), an initiative that consolidates Internet standards to help companies develop SuiteSpot applications.

Notes and Exchange have scores of independent developers creating programs for those platforms. But third-party developers are also working on applications for Netscape servers, and companies are releasing a flood of HTML editors, Web browsers, Java tools, and other software based on Internet standards that can be used with SuiteSpot.

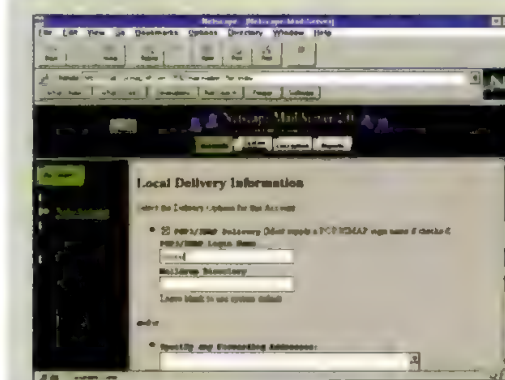
SPOT CHECK

We tested the three SuiteSpot servers for Windows NT Server that were shipping at the time of our review: Enterprise Server 2.0, News Server 1.1, and Mail Server 2.0. SuiteSpot also includes LiveWire Pro, a development, maintenance, and administration toolkit. Although the Unix version of Netscape Proxy Server—which caches Web pages for better performance and security—was shipping during our testing, the Windows NT version was not yet available.

Each SuiteSpot service that is installed on the same machine shares the same Administration server, which you access using a Java-enabled Web browser such as Navigator. You can manage multiple servers remotely, but you must have an Administration server set up on each one, and you

But SuiteSpot lacks examples of groupware applications, such as workflow, making it difficult to get up and running. Netscape plans to offer sample applications with future versions of SuiteSpot.

SuiteSpot's Mail and News servers provide more traditional messaging features. The Mail Server supports all of the major Internet messaging protocols: SMTP, POP3, and IMAP4. IMAP4 promises to let remote users synchronize network and local stores when connected. But IMAP's mobile options don't apply to Web pages or newsgroup discussions. And unfortunately, if you want to use IMAP4 with Netscape's Mail Server today, you have to get a third-party mail client (see "Internet Messaging" for a discussion of IMAP products). To test e-mail



SUITABILITY TO TASK

SuiteSpot

	Power	Ease
Administration	Fair	Fair
Messaging	Fair	Fair
Collaboration	Fair	Fair
Internet integration	Fair	Good
Applications development	Fair	Poor
Remote access	Poor	Fair

Each SuiteSpot service shares the same browser-based administration screen, but otherwise, integration is limited.

must log on to each machine separately. This can make managing large networks difficult. Not surprisingly, SuiteSpot works only over TCP/IP—unlike Notes and Exchange, which besides TCP/IP support IPX/SPX, NetBIOS, and AppleTalk.

Central to SuiteSpot is Enterprise Server 2.0, Netscape's high-capacity HTTP server. Enterprise Server was our Editors' Choice for enterprise-wide Web server (see "Web Servers," September 10, 1996). Enterprise is the focus of the majority of SuiteSpot's development and management tools. With Netscape's Web servers, you can run Java programs, JavaScript or Common Gateway Interface (CGI) scripts, or programs written to the Netscape Server API (NSAPI).

The Web server is an extremely open-ended proposition. You can use any HTML authoring tool to create pages. The Navigator client is built on an open architecture, supporting JavaScript and plug-in applets to extend its functionality.

with SuiteSpot, we used the POP3 capabilities included with Navigator Gold 2.02. Netscape will include IMAP4 support with Galileo (the code name for the next major Navigator release after Version 3.0). Galileo is scheduled to ship by the end of the year.

A THIN CLIENT

The Netscape Navigator client lets you connect to any POP3 mail server or NNTP-based newsgroup server. Similarly, any POP3 e-mail front end or NNTP news reader should work with SuiteSpot servers (in this issue, see the articles "Building the Perfect In-Box" for reviews of e-mail clients and "Framing the Discussion" for reviews of news readers). But message formatting is pretty bland, with no rich text, graphics, or embedded objects, as in Notes and Exchange. You can, however, include MIME attachments with your documents.

If you want to modify the structure of

mail or news messages, you're out of luck. News and mail forms are predefined and limited. For example, users have no way of adding a new column, such as a category, to a news view. The next version of the News Server promises to remedy this situation.

Navigator lets you create personal address books for user names and addresses. But SuiteSpot currently has no shared address book. Netscape's Directory Server will provide a public address book for users to get and verify names. The Directory Server will also let SuiteSpot applications access other LDAP-compliant services, including NetWare Directory Services and, later this year, Notes Name and Address books. Microsoft also plans to implement LDAP in the next version of Exchange and later in Windows NT Server. Until Netscape ships its Directory Server, however, addressing mail can be cumbersome.

MANAGEMENT AND DEVELOPMENT

While its shrink-wrapped groupware services, such as mail and discussion, may not be up to par compared with proprietary groupware systems, Netscape does offer an armload of development and maintenance tools that experienced Webmasters will find useful for maintaining Web sites.

LiveWire Pro is a collection of tools designed to help create and maintain content on Web servers. With LiveWire Pro, developers can make JavaScript resources available to applications running on the Enterprise Server. These scripts can perform such actions as posting records to databases and updating the Windows NT directory, as Netscape does with its Administration server. However, LiveWire Pro's features are focused squarely on Netscape's Web servers, with no tools to customize Mail and News servers.

SuiteSpot is growing into an impressive group of Internet products. But SuiteSpot's lack of advanced and integrated features makes it unsuitable for powerful groupware applications. For now, you'll want to look at Notes or Exchange for a more useful groupware installation.—TP

SuiteSpot. List price: \$3,995; Netscape Navigator Gold 2.02, \$79 per license. Netscape Communications Corp., Mountain View, CA; 415-937-2555; home.netscape.com. Circle 517 on reader service card.



*Can "open" and "inexpensive" win?
The debate will rage between the Internet faction and the
proprietary-but-open crowd. One thing's for sure:
Internet products are still evolving.*

By Frank J. Derfler, Jr.

MESSAGING IS SOPHISTICATED stuff. Companies like IBM and Digital spent decades developing electronic mail and messaging systems, but corporate enterprise managers want solutions that don't demand cradle-to-grave dependency. Elsewhere in this feature, we examine what we might call "proprietary but open" PC-based messaging solutions from Lotus, Microsoft, and Novell. Generally, these products include collaboration and application development tools, in addition to e-mail. But now a breed of purely Internet-based solutions with a focus on e-mail is offering competition. A steady stream of companies is promising high-powered e-mail and some collaborative services as the result of work done

in many places by many people with only the light of some draft Internet standards to guide them.

The Internet zealots want to replace file servers with Web servers and make the browser the home port for all desktop operations. They say you should be able to pick and choose mail clients and servers without regard to brand names. They say you should be able to size and improve your workgroup services on an

incremental scale. They base their e-mail work on widely discussed protocols (evolving too fast to become official standards) such as IMAP4, MIME, and LDAP. They offer other services, such as threaded discussions, based on NNTP. (Don't worry, we provide some explanations and a glossary to salve your acronym burn.)

The proprietary-but-open vendors have promised to make their messaging servers recognize and respond to requests

from e-mail clients using Internet protocols. For example, Lotus recently shipped Domino, an HTTP interface for Notes that allows any Web client to access a Notes database and applications. Microsoft's Exchange Web Access Connector, set

for end-of-year release, will allow access to Exchange data from a browser, and GroupWise 5 will continue to have the WebAccess option to offer e-mail services to Web browser users. But will the messaging server products from Lotus, Microsoft, and Novell give clients using Internet technologies the same level of service received by proprietary clients?

When we posed these questions to the designers of the proprietary-but-open

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spent years promoting
their proprietary
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Now come the open
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Where things are



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products, the answer across the board was no. Sure, they plan to give their servers the ability to respond to clients using HTTP, POP, IMAP, and MIME. But don't expect to get the class of service available from an integrated e-mail application. The developers say that proprietary clients and servers can take greater advantage of server-based rules for message handling and directory schemes, use sophisticated models for replicating stores of messages among servers, and use more advanced security processes than products based on Internet technologies.

Of course, the people developing products using Internet messaging technologies disagree. They say that with such a broad range of resources across the world focused on Internet development, no single company can keep up.

An Internet-based product like Ipswitch's IMail for Windows NT seems to support that view. IMail users can give the server forwarding addresses and choose from many rules for handling mail based on words in the subject line, the originator's ID, attachments, the message size, or other criteria.

But messaging products such as IMail depend on the presence of a whole TCP/IP infrastructure. You must have a DNS (Domain Name Service) server and have TCP/IP running on every client and server, for starters. The TCP/IP infrastructure can represent a significant upfront cost for an e-mail system. Also, you can argue that, for now, the IMail client's

most spectacular tricks are as proprietary as those of Notes and Exchange.

Your decision on whether to invest in a back-end e-mail infrastructure based on Internet technologies or to trust the more proprietary products depends on how much you have invested or plan to invest in the overhead of the Internet, and on the services you must have. On the Internet side, do you intend to give everyone access to a primary and a back-up DNS server? Is your IP addressing scheme up to date? Do you use the Dynamic Host Configuration Protocol (DHCP) to manage IP addresses? Are you comfortable with Unix? Even if the answer to each of these questions is no for now, will the pressure of a corporate intranet push you in these directions in the near future? If so, then you are a candidate for mail systems based on Internet technology.

But the Internet-based products are still evolving. Replication, for example, is a feature currently missing from Internet-based e-mail software. Work needs to be done on centralized utilities for server administration and for features like multiple levels of security and access within the e-mail system.

STUFF FROM THE INTERNET

Lotus and Microsoft spent the last few years persuading developers and network managers to believe in either the VIM (Vendor Independent Messaging) or the MAPI (Messaging Application Programming Interface) proprietary

messaging practices. Microsoft and MAPI won that battle, but at the same time the Internet Engineering Task Force, the World Wide Web Consortium, and the Internet Mail Consortium were developing more widely supported standards, including the HTML and HTTP protocols used on the Web.

LAN e-mail systems, such as Lotus cc:Mail and Microsoft Mail, use a server-centric approach. Servers store e-mail messages as files in subdirectories, and client-side applications read and manipulate the messages on the server. The more modern Exchange and Notes products use client/server architectures to implement actions efficiently between the client and the server. Internet messaging technologies take an even more distributed networking approach.

The Post Office Protocol (POP) is the oldest and most widely used e-mail standard in the Internet family. Internet service providers typically offer customers POP3 (the third major software revision) Internet mail service. You can get POP3 client software for practically every combination of hardware and software. The most popular for PCs and Macintosh systems is Qualcomm's Eudora (reviewed in "Building the Perfect In-Box" in this issue).

POP servers operate in an economical store-and-forward fashion. The servers exchange mail across the Internet and hold incoming mail for their clients. The client software initiates a connection to the server and logs in. After authentica-

GLOSSARY

Internet Messaging Terms

IMAP4 (Internet Message Access Protocol, Version 4) An evolving application protocol that allows a client to access and manipulate e-mail messages on a server. More sophisticated than POP3, IMAP4 allows an off-line client to synchronize a mailbox with a server.

LDAP (Lightweight Directory Access Protocol) An emerging directory service protocol backed by Netscape and other vendors, designed to identify all network resources to clients using a subset of the X.500 directory standard. LDAP is specifically targeted at simple applications like Web browsers and other Internet software.

MIME (Multipurpose Internet Mail Extensions) A set of extensions to SMTP designed for transmitting nontext e-mail message attachments.

NNTP (Network News Transfer Protocol) The protocol used for posting and retrieving news articles on Usenet newsgroups.

POP3 (Post Office Protocol, Version 3) A simple application protocol used to retrieve e-mail from mail servers.

SMTP (Simple Mail Transfer Protocol) A protocol that defines e-mail transmission over

networks using TCP/IP or other protocols.

UUCP (Unix-to-Unix Copy Program) A utility originally developed for Unix systems that transfers files between two computers. On some systems, UUCP is used instead of SMTP for e-mail transfer.

Uuencode/uudecode A method of sending binary e-mail attachments as plain ASCII text.

X.500 An International Telecommunications Union (ITU) standard for managing hierarchical online directories of users and resources. LDAP uses a subset of X.500 services.

POP vs. IMAP

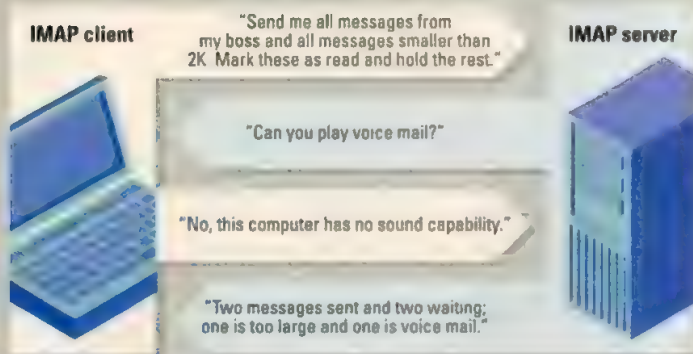
POP: store and forward

The Post Office Protocol (POP) is quick and simple. A POP server holds messages, delivers them to a client when the client requests them, and then deletes them.



IMAP: client/server

The Internet Message Access Protocol (IMAP) establishes a client/server relationship so that a client can use the server to filter and store mail. IMAP is more practical than POP for checking mail over varying connection speeds.



tion, the POP server transfers everything in its queue that is addressed to the client, and then most POP servers clear the queue. The interchange is quick and efficient but not flexible or repeatable. If you lose the hard disk on your client computer, you've lost your e-mail. Or if you want to see previously received mail from a second computer, you can't. Some vendors have workarounds that can tell the server not to delete messages, but nothing they offer approaches the replication capabilities of Notes or Exchange.

The Internet Message Access Protocol (IMAP) is replacing POP. IMAP4, an emerging standard, continues the evolution of a client/server messaging system using remote procedure calls. An IMAP server does a lot more for the client than a POP server does. IMAP client programs can give the user choices about what categories of messages to draw from the server, where to store messages, and what the server should do with specific categories of read messages. (For more details on how the protocols work, see "Choosing an E-Mail Protocol," *PC Magazine*, December 5, 1995.)

Right now, much IMAP software is produced by universities and supported through forums and e-mail. Popular client programs include Pine for Unix platforms and PC-Pine for DOS, from the University of Washington, and Mailstrom for the Macintosh, from Stanford University. Netscape's SuiteSpot (reviewed in

"Reaching for the Net," in this issue) includes IMAP4 in its mail server, and a Netscape Navigator client for Windows is scheduled to be released by the end of the year. For Windows clients, Esys Corp.'s Simeon and The TeamWARE Group's Embla (both reviewed in "Building the Perfect In-Box") support IMAP.

Surf over to ftp.cac.washington.edu/imap/imap.software for a current list of companies planning and shipping IMAP products. You'll find clients for NextStep, OS/2, VMS, Windows, and other operating systems. IMAP server software is available for all flavors of Unix and for Windows NT, but there's very little for NetWare or OS/2.

You'll also want to check The IMAP Connection at www.imap.org, maintained by the University of Washington, for the latest news and documentation on the IMAP protocol, as well as links to other IMAP-related sites.

The Multipurpose Internet Mail Extensions (MIME) give Internet e-mail users the ability to attach files to messages. The most sophisticated MIME extensions help the client PC select the correct application to view or execute the file. In conjunction with IMAP, MIME provides a way to create rich and useful messages. MIME is a feature of new IMAP clients.

Similarly, the Network News Transfer Protocol (NNTP) is part of many browsers. NNTP sets up the structure for the threaded discussions carried on

in Internet newsgroups. MIME does not work with NNTP, however.

Sun Microsystems is focusing on IMAP. In April, SunSoft rolled out an IMAP4 mail system in its Solstice product family. Versions of the \$995 Solstice Internet Mail Server are available for the Sparc and x86 versions of the Solaris operating system. Client packages are ready for many operating systems, including all varieties of Windows. Other client packages will work with the Solstice Internet Mail Server, which lets users download only the mail they want, with or without attachments, and efficiently work across slow links or off-line. See www.sun.com/solstice for more detailed information.

Digital Equipment Corp. has a broader focus. Digital's Internet AlphaServer (which uses Digital's Unix on Alpha hardware) and Digital's AltaVista Mail for Windows NT have IMAP capabilities, but they are just catching up on IMAP4. See altavista.software.digital.com for more information.

Clearly, organizations committed to Internet networking, such as universities, will be good markets for IMAP4 mail systems. The presence of Digital and Sun gives Internet e-mail more legitimacy for corporate installations. The choice of client software might soon become an individual or workgroup decision, but messaging server decisions will be driven by considerations of replication, naming services, and security. □

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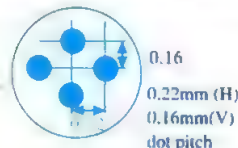
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 against a wall

VESA-DPMS, Energy Star
 and NUTEK power saving



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 and VisionMaster Pro:
 Diamondtron, 0.30mm AG tubes

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 mask flat square tube on Vision
 Master 21" gives improved vertical
 resolution and greater brightness



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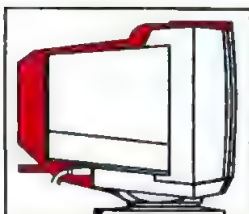
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17-INCH MONITORS

Widen Your

HORIZONS

A 17-inch monitor can make you more productive, and these 49 displays are more affordable than ever.

The demand for larger computer displays continues to grow. For entry-level users, 15-inch monitors are now the norm, and sales of 17-inch displays are booming. The market for 17-inch monitors should grow almost 50 percent this year, and next year one of every four monitors shipped in the U.S. will be a 17-inch model, according to Stanford Resources, a San Jose-based market research firm.

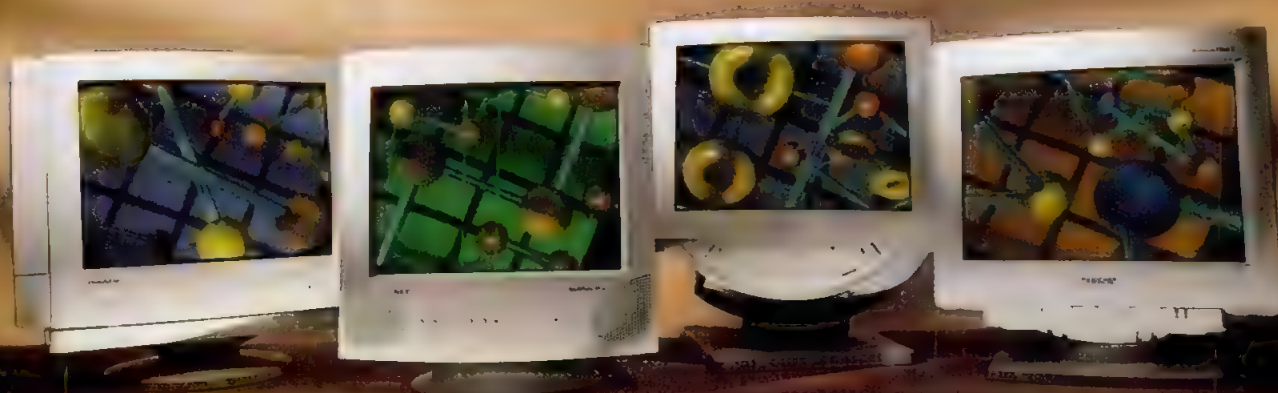
Clearly, businesses and private users are seeing the benefits of larger screens. The rise of e-mail and the Web mean the typical business user will have several productivity apps and communication programs open at once. A larger screen running at a higher resolution means you can see more of these open windows at once, as well as have a better view of documents and large spreadsheets. And lower prices have fueled demand. Prices have followed a steady downward trend, aside from a small uptick early last year; the average price of the monitors in this review is \$770 on the street. And it's now possible to buy a decent—good, not just decent—17-inch monitor for \$600.

The review criteria for this feature were straightforward: We review the current crop of 17-inch monitors new since our last roundup (though we invited back past Editors' Choice honorees that are still on the market). We required that an entry be from the manufacturer, designer, or primary distributor of a model in the U.S.

We also required that a monitor support a vertical refresh rate of at least 75 Hz at a resolution of 1,024-by-768. The *vertical refresh rate* is the number of times the monitor displays a complete image each second. A high refresh rate translates into a more stable screen image that is easier on the eyes; a low refresh rate means you will see noticeable screen flicker. The Video Electronics Standards Association (VESA) has set 75 Hz as its standard for an acceptably ergonomic display, and it may raise the bar to 85 Hz beginning in 1997.

The 42 manufacturers here submitted 49 models for testing at ZD Labs in Foster City, California. Because many of the vendors have three or more monitors in their line, we as a whole had to choose the 17-inch monitor that we

By *Jamie M. Bsales*



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to represent the company in the review; we allowed the largest players in the market to submit two.

Hewlett-Packard, Philips, Tatung, and TVM would have met our review criteria but did not have full production units in time for testing. Nokia, the maker of an Editors' Choice designee two years ago, submitted a monitor for review but later sought to withdraw from the roundup. Nokia says, "To have a legitimate, objective review, Nokia believes products must

be acquired from the retail or distribution channel, because acquisition from the vendor opens the possibility of manipulation of the monitors." (Nokia says it does not optimize the products it submits for review.) This year, as previously, *PC Magazine* has spot-checked selected monitors by testing duplicates purchased retail. We found variances that we believe were within the realm of unit-to-unit variations. In some cases, the units we purchased actually outperformed those submitted for review by vendors.

MONITOR MATCHMAKER

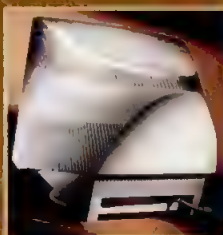
The 17-inch monitor market has become tiered into three categories: graphics professionals, mainstream business users, and budget-conscious home and small-office users. The most expensive models sell for \$900 to \$1,100 or more and can deliver acceptable refresh rates at 1,280-by-1,024 or even 1,600-by-1,200 resolution. Aimed at image-editing professionals, CAD users, and desktop publishers (who need to see as much of an image, drawing, or layout on-screen as possible), these models also offer a host of user-settable adjustments for nearly every screen, color, and image attribute. Some makers also include separate color-matching software applets, most commonly Colorific from Sonnetech Ltd. (415-957-9940; www.colorific.com), so you can match the colors you see on-screen to the colors you get from your output device. They also offer dual connectors (DB-15 and BNC) so you can hook the monitor to two machines simultaneously.

For the vast majority of users, 1,024-by-768 (sometimes called XGA) is the maximum resolution they'll want to use on a 17-inch monitor, so 1,280 or 1,600 may represent unneeded capability. And some users may find 800-by-600 (Super VGA) easier on the eyes. A 17-inch display has 30 percent more screen area than a 15-inch display. If you were comfortable with 800-by-600 resolution on a 15-inch monitor, switching to 1,024-by-768 resolution on a 17-inch monitor gives you screen fonts that are the same size.

Beyond that, you'll want creature comforts like easy-to-use controls for screen attributes such as brightness, contrast, and pincushioning. Good business

HIGHLIGHTS

17-Inch Monitors



EASY ON THE EYES

Monitors don't have to look ugly from the rear, as the NEC MultiSync M700 demonstrates with its sloping design. A la Frank Lloyd Wright.

Also included in its

setup are 2.5-watt speakers, which are acceptable for individual use but easily overpowered.



MAKE THE RIGHT CONNECTION There's one way to make a sharp image even sharper: Couple your monitor to your high-end graphics adapter with a coaxial BNC cable, which delivers better signal quality than a standard VGA connector. Better monitors (such as this EIZO FlexScan) support both, so those working with two PCs can switch between the two at the touch of a button.



ONE TOUCH The Optique V775's One Touch monitor controls work well with the on-screen display-setting menus. With one hand you can turn the V775's rotary dial to navigate the control menu and press a single round button to make selections. We found them to be both intuitive and accurate.

MOUNTED SPEAKERS

The GoldStar Studioworks 78m's speakers won't satisfy audiophiles but are a clear step above the average, inexpensive multimedia speakers and better than the speakers integrated in many other monitors.



Graphics professional

**EIZO FlexScan
TX-C7S**

**Sony Multiscan
17se II**

Home and small office

Optiquest V775

**Panasonic
PanaSync S17**

Mainstream business

**Compaq V70
MAG DX700T**

**Samsung
SyncMaster 17GLi**

The 49 monitors we tested fell into three categories, based on price and performance: high-end for the graphics profession, mainstream for business users, and value-oriented for the home/SOHO market.

High-resolution capabilities and superior image and color quality are essential for CAD, DTP, and image-editing pros. In this category we award Editors' Choice honors to the EIZO (formerly Nanao) FlexScan TX-C7S (\$1,125 street) and Sony Multiscan 17se II (\$1,000 street). The EIZO's image was especially sharp and clear, with no detectable faults; it rated fourth overall on our new MonMark measure of monitor performance. The Sony Multiscan 17se II, with the third-best MonMark score, produced some of the sharpest photo images we saw.



Six other monitors are also worthy choices for the high-end user and merit an honorable mention: the Apple Apple-Vision 1710 Display (\$970 street); the Iiyama VisionMaster Pro 17 (\$850 street), the NSA/Hitachi SuperScan Elite 17 (\$880 street), Panasonic's PanaSync Pro P17 (\$850 street) and Wyse Technology's WYSEvision (\$920 street).

For the typical business user, we found three standouts that win Editors' Choice accolades. The Compaq V70 (\$730 street) produced some of the highest performance results in its class, earning the fifth-best MonMark score. MAG Inno-Vision's Trinitron-equipped MAG DX700T (\$700 street) was a close sixth and was among the brightest monitors we tested. Samsung's SyncMaster 17GLi (\$710 street) was an Editors' Choice winner in this category last year, and it is still an excellent choice for the corporate user, delivering excellent screen uniformity and a crisp image. Honorable mentions are earned by the NEC MultiSync M700 (\$900 street), which produced the highest MTF score, and the Sony MultiScan 17sfII (\$800 street), with the top MonMark score.

For those on a tighter budget, two products earn Editors' Choice recognition. The Optiquest V775 (\$650 street), a performance standout in its price class, delivered rich colors and a sharp picture. The Panasonic PanaSync S17 (\$670 street) showed excellent color range scores and a bright image. Two other monitors in this class merit honorable mention. The Hyundai DeluxScan 17B (\$600 street) and Smile International's Smile CB1716SL (\$630 street) are among the best budget-priced monitors in this review.

models range in price from \$700 to \$900, and this year we've seen some notable entries as low as \$650.

The third-tier user is the budget-minded home or business user. We found a host of perfectly acceptable monitors, each costing less than \$650 on the street. These units generally offer just basic controls, and there is some tradeoff in overall image quality compared to the more expensive models. These units should prove adequate for a user who wants a larger screen for occasional use or for gaming or surfing the Web.

The test results and analysis we present in the reviews are a good indicator of how suited a particular monitor is to a particular task. For instance, if you primarily want a clear image for sharp text and graphics, look for a monitor with better MTF and misconvergence scores, which are both indicators

of image sharpness. To help put all the objective test results in perspective, this year we introduce our MonMark rating system. The MonMark score is a composite representation of our major objective test results, weighted to reflect the attributes most important to mainstream business users.

In addition to the instrument-based objective tests, we also put the monitors through a series of subjective evaluations. We displayed color photos in Adobe Photoshop to test a monitor's ability to accurately display tough images. We also used the monitor test patterns in Sonera Technologies' DisplayMate video utility (800-932-6323, 908-747-6886; www.displaymate.com), which are designed to help end users improve image quality. Reviewers chose the top performers on the objective and subjective tests for a final jury analysis, in which they were compared side by side.

TERMINAL TERMINOLOGY

While all the monitors here use the same basic CRT technology, there are three different types of tubes. The most common (34 of the 49 units) is the *Invar shadow mask* tube. The *mask* is a thin sheet of metal perforated with holes that align with the phosphor dots on the front of the tube. Different grades of CRTs have different spacing between the phosphor dots; the industry norm is to measure the distance between phosphors of the same color and to state this *dot pitch* in millimeters. A smaller dot pitch means more closely spaced pixels and, in general, a sharper picture. The best shadow mask tubes in this review have a dot pitch of 0.25 mm, though a pitch of up to 0.28 mm is still fine for a 17-inch display.

The second type of tube (14 models reviewed here) uses an *aperture grille*—an array of thinly stretched wires—and phosphor stripes to create the screen image. Aperture grille tubes (manufacturers can choose either Sony's Trinitron or Mitsubishi's DiamondTron tubes) generally

Our Contributors: BRUCE BROWN and JOHN R. QUAIN are contributing editors of *PC Magazine*. HOLLY AGUIRRE is a staff editor of *PC Magazine*. STEVE BUEHLER is the director of PC Labs, West Coast, in Foster City, CA. BRIAN FIKES is a project leader at ZD Labs, and JAMIE M. BSALES was the associate editor in charge of this story.

HARDWARE

17-Inch Monitors

have a *stripe pitch* that ranges from 0.25 mm to 0.28 mm, though some users contend they deliver a brighter, crisper image than shadow mask tubes with similar specs because they use phosphor lines instead of discrete dots. Note that an aperture grille tube requires horizontal damping wires to hold the grille in place. Although these wires are hair-thin, they are visible, and some users (especially CAD pros) may find them annoying.

This year, NEC introduced a new type of shadow mask, called a *slot mask*, for its MultiSync M700 model. This mask uses

will communicate with its host video adapter to transmit information such as resolution and refresh rate. To be PnP, a monitor and video card have to work together according to the VESA DDC specs, and the video card has to work with Windows 95 to put the correct information into the Registry.

In practice, we have found that many combinations of DDC-compliant monitor and video card just don't work as promised, and it's often almost impossible to trace the cause. For instance, rarely will the video card automatically

nient than having to attach serial devices to the back of your CPU, and USB will allow you to have more of these devices connected at once. Some monitor vendors are resisting, however, and say the USB hub connectors are better suited to the keyboard or system unit.

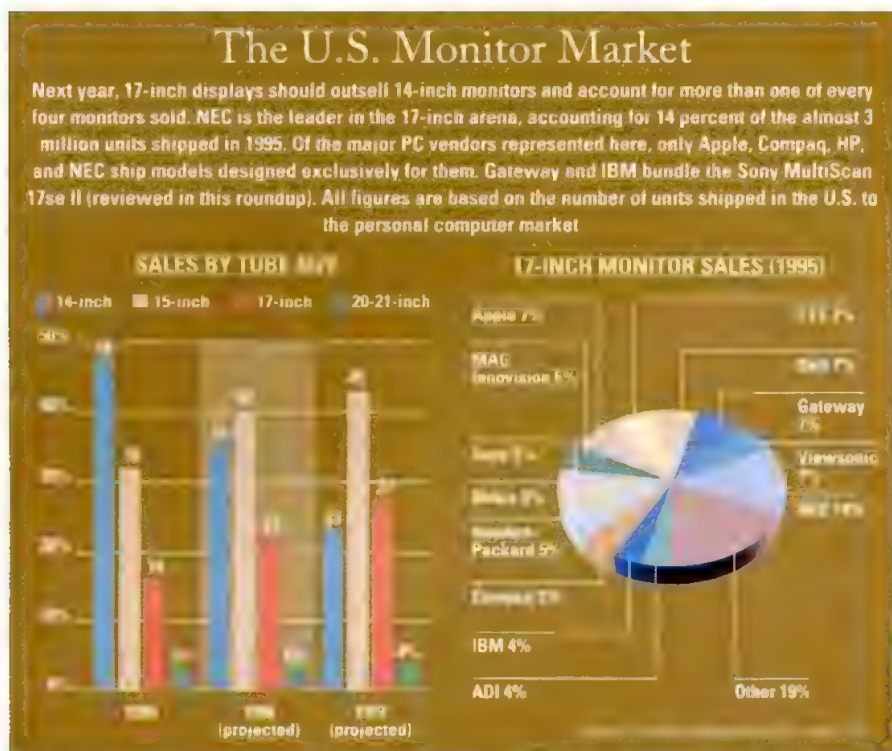
OTHER CONSIDERATIONS

Some users may also want to consider a multimedia monitor, which offers speakers (and usually a microphone and headphone jack) built into the case. While we generally found that the sound quality does not approach that of a good set of external speakers (the notable exception being the Nokia Multigraph 447Xav, whose clever swivel base doubles as a subwoofer), the quality is fine for typical business audio, and this approach cuts down on desk and cable clutter.

Many users are concerned with the ELF and VLF emissions coming from a monitor. Though there is no conclusive evidence that such emissions are harmful, common sense suggests that less exposure is preferable. All of the units in this review meet the Swedish government's MPR II specification for a safe amount of electromagnetic emissions, and 12 meet the stricter standards backed by TCO (the Swedish Confederation of Professional Employees) and widely adopted in Europe.

Also consider the warranty and support programs a manufacturer offers with the unit. The monitor is an integral part of your system, accounting for about one-third of the total purchase price, and a good warranty is a must. Look for three years' coverage on parts, labor, and the CRT.

One final note: More than any other piece of computer hardware, monitors show variation from one to another in an assembly line. Thus, supposedly identical models will have noticeable image differences. Also, rough handling during shipping can adversely affect the image quality. If you're a fanatic and you're buying just one unit, see if you can get the store to unbox two or three identical monitors and install them on PCs with like graphics adapters. Then pick the best-looking one. In the interim, the reviews that follow should help you pick the 17-inch diamonds from among the zirconia.



elongated phosphor ovals rather than dots, which NEC claims delivers a crisper image than traditional designs can.

Another differentiating factor is the *viewable area* a monitor delivers. Because of the way a CRT is manufactured, there is always some dead area around the outer edge; so while the glass itself measures 17 inches diagonally, the display size is actually smaller. As a result of pressure from several states' attorneys general to be more truthful in labeling, all literature and cartons now list both.

Most of the monitors in this review tout themselves as Plug and Play models, which means they adhere to the *DDC* (Display Data Channel) specification. The DDC spec maps out how a monitor

sync to the highest refresh rate that the duo can handle. So if your monitor comes with an INF file disk with Windows 95 Registry information, you should use it, even if the monitor is PnP. If your monitor doesn't come with one, don't trust that your video card's software will automatically know the capabilities of your monitor—doublecheck your monitor's manual.

A new technology you will see appearing on monitors in early 1997 is USB, for *Universal Serial Bus*. This medium-bandwidth interface will allow you to connect a host of peripherals (mouse, keyboard, page scanner) directly to your monitor (provided your host system supports USB). This will prove much more conve-



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76i/76m ¹	17" FST (15.7" VIS)	.28mm dot	1024x768 @ 80 Hz NI
56i	15" FST (13.6" VIS)	.28mm dot	1024x768 @ 80 Hz NI
56m ¹	15" FST (13.6" VIS)	.28mm dot	1024x768 @ 80 Hz NI

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ViewSonic 15GA	15"/14.0"	0.27mm	1,280 x 1,024	Yes	Yes	\$499
ViewSonic 17GS	17"/16.0"	0.27mm	1,280 x 1,024	Yes	Yes	\$699
ViewSonic 17GA	17"/16.0"	0.27mm	1,280 x 1,024	Yes	Yes	\$799
ViewSonic GT770	17"/15.9"	0.25mm*	1,280 x 1,024	Yes		\$899
ViewSonic 20G	20"/18.4"	0.28mm	1,600 x 1,280		Yes	\$1,299
ViewSonic GT800	20"/19.1"	0.30mm*	1,600 x 1,280	Yes		\$1,899
ViewSonic G810	21"/20.0"	0.25mm	1,600 x 1,280	Yes		\$1,745

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*Optional microphone adapter may be required with certain Macintosh® systems. Prices and specifications subject to change without notice. Corporate names and trademarks stated herein are the property of their respective companies. © 1996 ViewSonic Corporation. All rights reserved.



Acer America Corp.

AcerView 78ie

The AcerView 78ie (\$800 street) is a good all-around performer and is a solid choice for the general business or home computer user who needs more screen real estate. Equipped with a 0.26-mm-dot-pitch Hitachi tube, the AcerView can deliver a 1,280-by-1,024 resolution at a rock-solid 80 Hz. It can also support 1,600-by-1,280 mode at 68 Hz, which makes that resolution a viable option for occasional, short-term use. The on-screen controls are simple to use, and Acer provides extensive controls for color and orthogonal adjustments.

The AcerView almost topped the charts on our Vertical and Horizontal Pincushioning tests. However, its RMS Misconvergence and Luminance scores, while acceptable, trailed most of the field. In subjective testing, colors were bright enough and photo images were crisp and clear, although the images were a bit dim. The user interface proved simple and straightforward, with no surprises.—*Holly Aguirre*

AcerView 78ie. Street price: \$800. Acer America Corp., San Jose, CA; 800-733-2237, 408-432-6200; www.acer.com/aac. Circle 441 on reader service card.

ADI Systems Inc.

ADI MicroScan 5V

If getting down to business is what you're all about, the ADI MicroScan 5V will help you see where you're going. With a street price of \$740 (\$899 list), the MicroScan is designed to give mainstream business users an affordable way to trade up to a larger display.

The MicroScan display uses a 0.28-mm-dot-pitch flat-square tube and features handy digital controls on the front panel. ADI has opted not to include the nearly ubiquitous (in this class) on-screen display for the adjustments. Graphics professionals will need to look elsewhere, as there are no color adjustments or more advanced controls. But its 1,024-by-768 resolution at a refresh rate of 76 Hz should satisfy mainstream users.

In both subjective and objective tests, the MicroScan 5V performed respectably. It scored near the top on our Misconvergence test (an indication of image crisp-



ness), and it delivered a well-focused picture in 1,024-by-768 mode. We did notice a large amount of vertical pincushioning on our test unit, however, and could not correct it. Still, the 5V is a good choice.

—*John R. Quain*

ADI MicroScan 5V. List price: \$899. ADI Systems Inc., San Jose, CA; 800-228-0530, 408-944-0100; www.adi-online.com. Circle 442 on reader service card.

AOC International (USA) Ltd.

AOC Spectrum 7NIr

The AOC Spectrum 7NIr monitor is a newcomer in the 17-inch market, and its low price (\$749 list, \$570 street) makes it a contender for budget-constrained home users. Overall image quality probably wouldn't be satisfactory for more demanding uses such as image editing and desktop publishing, however.

The Spectrum uses a shadow mask tube with a fine 0.26-mm dot pitch—surprising in this price range, where most units have 0.28-mm designs. The unit showed an unacceptably low score on our Average MTF test, and screen images did not appear as crisp as on other units. Generally below-average uniformity and geometry results detracted from the overall scores, and the poor luminance uniformity showed up as mottled patches in areas of light color.

The Spectrum is an unspectacular budget-priced monitor. If you're a home user or game player with purchasing decisions constrained by the reality of your checkbook—and your expectations aren't too high—you might consider the AOC Spectrum 7NIr.—*Steve Buehler*

AOC Spectrum 7NIr. List price: \$749. AOC International (USA) Ltd., Milpitas, CA; 800-228-7744; 408-956-1070; www.aoclt.com. Circle 443 on reader service card.

Apple Computer Inc.

AppleVision 1710 Display

The AppleVision 1710 Display (\$1,039 list, \$970 street) has the features and picture quality needed by even demanding image editing and desktop publishing professionals. The 0.25-mm-pitch Trinitron aperture grille tube provides a large viewable screen (16.1 inches diagonally). Unfortunately, the well-designed software-based controls, which can store multiple color and geometry settings, will work only on Macintosh systems. On any platform, the monitor internally calibrates itself to keep the colors from changing over time.

This was the brightest display we tested. Colors looked great, and its color scores were good to excellent. Even though the Average MTF results were fairly low, screen images looked sharp. The only visible problems were noticeable (but not unacceptable) misconvergence and a slight pincushioning error. If image quality is important to you, the 1710 Display is worth considering.—*Brian Fikes*

AppleVision 1710 Display. List price: \$1,039. Apple Computer Inc., Cupertino, CA; 800-538-9696, 408-996-1010; www.apple.com. Circle 444 on reader service card.

Compaq Computer Corp.

Compaq V70

Compaq's moderately priced V70 (\$730 street) is intended for mainstream business users. An Editors' Choice winner, the V70 performed quite well on our tests.

The V70 maintains a vertical refresh rate of 85 Hz at 1,024-by-768 resolution and uses a 0.28-mm-dot-pitch



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HARDWARE
17-Inch Monitors



Invar shadow mask tube from Hitachi. The on-screen controls are easy to use, and Compaq has added separate brightness and contrast dials on the front—a convenient touch.

Scores on our objective tests put the V70 in the top tier on our Misconvergence, Horizontal Pincushioning, and Uniformity tests, and it placed fifth in our overall Mon-Mark ranking. Although we didn't notice any problems on the subjective tests, our readings indicated significant vertical pincushioning. Text was generally crisp, though on subjective tests our sample color photos were less sharp. Still, the V70 is a fine choice for the corporate desktop.

—Bruce Brown

Compaq V70. Street price: \$730. Compaq Computer Corp., Houston, TX; 800-888-5858, 800-345-1518; www.compaq.com. Circle 445 on reader service card.

Cornerstone Imaging Inc.

Cornerstone Color 17/76

Cornerstone Imaging specializes in display products for document imaging. List-priced at \$895 (\$800 street), the Cornerstone Color 17/76 monitor is nearly identical to the NSA\Hitachi SuperScan Elite. The added value comes from Cornerstone's available bundle, the Image Accel2 Color 17/76 Display Subsystem, which couples a graphics card with the monitor (and adds \$400 to the price).

Well suited to its document-intensive mission, the 17/76 card and monitor turned out a sharp, focused image, scoring in the excellent range on the Misconvergence and Uniformity measures. The graphics card supports special features that make viewing scanned documents quicker and easier on the eyes, such as in-

stant zoom and a scale-to-gray algorithm that helps eliminate the stark black-on-white effect typical of low-resolution production scanning. Note that the card's Windows 95 drivers do not yet support 24-bit color mode.—*JRQ*

Cornerstone Color 17/76. List price: \$895. Cornerstone Imaging Inc., San Jose, CA; 800-562-2552, 408-435-8900; www.corimage.com/. Circle 446 on reader service card.

CTX International Inc.

CTX VL700, CTX PR700

CTX monitors are generally consistent performers, and there were no surprises from this year's models. The higher-end CTX PR700 (\$999 list, \$890 street) is designed for CAD users and desktop publishing. The value-oriented CTX VL700 is recommended for the mainstream business user and is attractively priced at \$755 list (\$660 street).

The PR700 utilizes a 0.25-mm-pitch DiamondTron aperture grille CRT. It supports a maximum resolution of 1,600-by-1,200 at 65 Hz, though most users will find 1,280-by-1,024 mode at 75 Hz delivers a more stable image. On our objective tests, the PR700 was near the top in color uniformity and color range. Its scores were good enough to place it into our jury testing, though compared with our other similarly priced favorites, the PR700 did not fare as well on subjective visual tests, showing comparatively inconsistent color quality.

The on-screen controls are simple and fairly intuitive. We did find the swivel base a bit too stiff. (This was a problem with the VL700 as well.)

Based on a 0.28-mm shadow mask

tube, the CTX VL700 delivered one of the sharpest, crispest images in its price class. It can deliver a flicker-free 75-Hz refresh in 1,024-by-768 mode. On subjective tests, the color uniformity was a bit off, and colors were not well saturated.—*HA*

CTX VL700. List price: \$755. **CTX PR700.** List price: \$999. CTX International Inc., Walnut, CA; 800-888-2012; www.ctxintl.com. Circle 447 on reader service card.

Daewoo Electronics Corp. of America

Daewoo CMC-1703B

The Daewoo Electronics' CMC-1703B (\$799 list, \$700 street) is targeted at the entry-level market, intended for SOHO and home users who don't need the highest performance but are looking for a 17-inch screen. But budget-constrained users can find a better performer for the same money elsewhere.

The Daewoo monitor uses a 0.28-mm-dot-pitch shadow mask tube and is best used in 1,024-by-768 mode, in which it can deliver a flicker-free refresh rate of 75 Hz. While the CMC-1703B was among the top ten monitors on our color tracking test, it scored in the bottom tier on the Average MTF, Luminance, Uniformity, and Vertical Pincushioning tests (despite its control to correct pincushioning). On our subjective tests, the monitor focused well and colors were consistent, if not terribly well saturated. We did notice bouncing on the Screen Regulation test, and there was some discernible misconvergence. All in all, you can do better.—*BB*

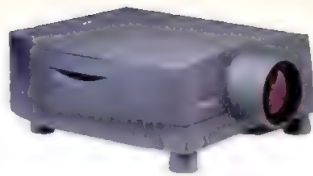
Daewoo CMC-1703B. List price: \$799. Daewoo Electronics Corp. of America, Lyndhurst, NJ; 800-250-9066, 201-460-2000; www.daewoo-display.com. Circle 448 on reader service card.

Delta Products Corp.

Delta DB-1765EA

The Delta DB-1765EA (\$799 list, \$700 street) is an entry-level monitor intended for use with multimedia applications at home or in school. Equipped with integrated speakers that are suitable for individual use, the Delta is an acceptable display.

The 0.28-mm-dot-pitch shadow mask tube can deliver 1,024-by-768 mode at 75 Hz (note the factory-preset rate is 72 Hz,



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so you'll have to set the higher refresh rate via your graphics card utility). Clear markings and a logical menu make user settings—which include speaker volume—simple to use.

The DB-1765EA scored among the top ten on our Uniformity measure. Most other scores were in the upper-middle range, good enough to give the unit an 11th-place on our MonMark score. The color-range score fell among the bottom ten, and in subjective testing misconvergence was quite noticeable. However, the monitor's focus was excellent, and colors and photo images appeared rich and clear. Its ease of use and generally pleasing performance make it a fine choice for general use.—*BB*

Delta DB-1765EA. List price: \$799. Delta Products Corp., Fremont, CA; 510-770-0660, 888-883-3582; www.deltaca.com. Circle 449 on reader service card.

EIZO Nanao Technologies Inc.

FlexScan TX-C7S, FlexScan T2-17TS



EIZO Nanao Technologies decided last March to change the company name in North America and Japan to match its name in the rest of the world. So don't look for the Nanao name on the new FlexScan TX-C7S (\$1,299 list, \$1,125 street). The familiar Nanao name will persist until sometime in 1997 on the FlexScan T2-17TS (\$1,299 list, \$1,150 street), an Editors' Choice winner last year. These prices dictate that only graphics professionals need apply, and both models deliver.

Both have on-screen menus, color and control software, and BNC and standard VGA connections. The newer TX-C7S employs a 0.25-mm-pitch Trinitron aperture grille tube and has a maximum recommended resolution of 1,280-by-1,024 with an excellent 86-Hz vertical refresh rate. The monitor generally outscored the older model on our tests and placed a commendable fourth on our MonMark scale. It stood out particularly on the Average MTF, Luminance, and Uniformity tests. In subjective evaluation, the TX-C7S's image was particularly sharp and clear, with no detectable faults.

The T2-17TS uses a DiamondTron



tube and delivers 1,280-by-1,024 mode at 82 Hz. It was a good performer on our tests and delivered image quality nearly as good as its sibling's. If you need a top-flight monitor for graphics-intensive work, either EIZO monitor is almost unbeatable.—*JRQ*

FlexScan TX-C7S. List price: \$1,299. **FlexScan T2-17TS.** List price: \$1,299. EIZO Nanao Technologies Inc., Cypress, CA; 800-800-5202, 310-431-5011; www.eizo.co.jp/ welcome. Circle 450 on reader service card.

GVC Maxtech Corp.

Maxtech XT-7800

One of the lowest-priced monitors in this review, GVC Maxtech Corp.'s \$675 (\$590 street) Maxtech XT-7800 display is also one of the more limited models we looked at. It performed well enough for home use for games and the like, but those with more stringent needs will have to look elsewhere.

Using a conventional 0.28-mm-dot-pitch CRT, the XT-7800 can display a maximum resolution of 1,280-by-1,024, but at a vertical refresh rate of only 60 Hz. For a more pleasing picture, you'll have to drop the image down to a resolution of 1,024-by-768 and change the vertical refresh rate to 75 Hz. (Since the factory-preset rate is only 70 Hz, you'll need to make some screen adjustments.)

On objective tests, the XT-7800 was not one of the top performers, but it did well enough across the board considering its price. In subjective evaluation, the resolution was acceptable, although it was clearly a notch below the leading displays we examined, and it lacked a certain degree of sharpness and uniformity.

Even though it has digital controls and an on-screen menu system, you won't be bowled over by the XT-7800.—*JRQ*

Maxtech XT-7800. List price: \$675. Maxtech Corp., Cerritos, CA; 800-936-7629, 310-921-1698; www.maxcorp.com. Circle 459 on reader service card.

Hitachi America Ltd.

Accuvue GX17L

Hitachi America Ltd. is the largest CRT manufacturer in the world, but its Accuvue GX17L (\$765 street) misses the mark. Performance is adequate for mainstream business users, but you can get more features and a better image elsewhere for the same money.

The Accuvue is one of the only monitors that doesn't support Plug and Play, so Windows 95 users intent on PnP convenience will be disappointed. The monitor's controls also seem outdated; user-adjustable settings are limited and must be accessed via a series of function lights and adjustment buttons on the front of the case. The 0.28-mm shadow mask tube can deliver 1,024-by-768 resolution at a 75-Hz refresh rate.

The Accuvue's objective scores were average, but it scored in the bottom ten on the Average MTF and Luminance measures. The latter deficiency was easily observable in subjective testing, where the Accuvue appeared to be less bright than many of the other monitors in this roundup. Color images looked good, with clear detail, but colors in large blocks were a little muddy.—*BB*

Accuvue GX17L. Street price: \$765. Hitachi America Ltd., Fremont, CA; 800-259-9939, 510-661-6351; www.hitachi.com. Circle 451 on reader service card.

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17-Inch Monitors



Hyundai Electronics America

DeluxScan 17B

Designed for the general business and SOHO user, the Hyundai DeluxScan 17B (\$629 list, \$600 street) is a solid value. One of the least-expensive units we tested, the DeluxScan performed well for its class and has all the features a mainstream user needs.

Utilizing a 0.28-mm-dot-pitch shadow mask tube, it delivers 1,024-by-768 resolution at a comfortable 75-Hz refresh rate (it can handle 1,280-by-1,024, though only at 60 Hz). The extensive on-screen digital controls are simple and intuitive.

The DeluxScan achieved an excellent score on our Average MTF test, and screen images were clear and consistent. It scored poorly on our Luminance measure, and in subjective evaluation our test unit was judged to be a bit dimmer than others. With a three-year warranty (parts and labor), the DeluxScan would be a great purchase for the small business owner or college student—and its price makes it a compelling alternative to a 15-inch monitor.—*HA*

DeluxScan 17B. List price: \$629. Hyundai Electronics America, San Jose, CA; 800-568-0060, 408-232-8000; www.he.com. Circle 452 on reader service card.

Iiyama North America Inc.

VisionMaster Pro 17

The Iiyama VisionMaster Pro 17 (\$949 list, \$850 street) is an excellent monitor. It delivers display quality and features good enough for image editors and CAD professionals, but at a price that's within the reach of most mainstream business users.

The unit boasts the highest scan ranges here and can display 1,600-by-1,200 resolution at 72 Hz or 1,280-by-1,024 at 85 Hz. It uses a 0.25-mm-pitch DiamondTron aperture grille tube and has plenty of controls in its on-screen display. Iiyama put extra effort into the details, such as making the case compact (just 16.5 inches deep), and provides free Colorific software.

The high MTF measurement confirmed our subjective opinion that the Pro 17 had one of the sharpest screens in this roundup. It also had very good color quality and did well on almost every test. For any user who wants a high-quality display, the Pro 17 is a good value.—*BF*

VisionMaster Pro 17. List price: \$949. Iiyama North America, Warminster, PA; 800-394-4335, 215-957-6551; www.iiyama.com/. Circle 453 on reader service card.

KDS

Visual Sensations VSx-7

With its swinging 1970s design, attached multimedia speakers, and low list price of \$649 (\$530 street), KDS' Visual Sensations VSx-7 is aimed at budget-minded home PC users. Unfortunately, if image counts, then the VSx-7 won't make much of an impression.

The VSx-7 delivers 1,024-by-768 resolution at 75 Hz; 1,280-by-1,024 mode is available, though only at a refresh rate of 60 Hz. The on-screen digital controls are easy to use and fairly extensive, and the included speakers can pump out more volume than many of the other all-in-one setups we tested. But if you turn the volume up too high, you'll get hissing and distortion.

Objectively and subjectively, image quality is lacking. The unit had one of the

worst Average MTF scores in this roundup, and its MonMark rating was third from last. Despite this unit's extremely sleek design, if you need a low-priced monitor, you can do better.—*JRQ*

Visual Sensations VSx-7. List price: \$649. KDS, Garden Grove, CA; 800-283-1311, 714-379-5599; www.kdsusa.com. Circle 454 on reader service card.

LG Electronics USA

GoldStar Studioworks 76i, GoldStar Studioworks 78m

GoldStar Studioworks monitors are priced competitively and offer good value among the displays we reviewed. The GoldStar Studioworks 76i (\$850 list, \$700 street) is a general-purpose business monitor, while the GoldStar Studioworks 78m (\$1,030 list, \$880 street, \$30 less without speakers) is intended for professional graphics and CAD users.

Based on a 0.28-mm-dot-pitch Invar shadow mask tube, the 76i's recommended resolution is 1,024-by-768, delivered at an 80-Hz vertical refresh rate. The striking case design features digital adjustments controlled via a single button plus a roller, though it was difficult to adjust pincushioning and trapezoidal geometry adequately. In subjective evaluation, the 76i had good sharpness and line focus and the colors appeared deep, but misconvergence was a problem. Color photographic images were clear but not particularly bright.

The 78m, with a finer 0.26-mm-dot-pitch Invar shadow mask tube, can deliver 1,280-by-1,024 resolution at 77 Hz. Overall, the 78m did better in testing than the 76i, though it had the same difficulty the 76i did in making fine adjustments and still had some minor misconvergence problems in subjective testing. We also noticed that focus was off a bit in horizontal-line resolution comparisons. The 78m's speakers are a clear step above the average inexpensive speakers.

Both GoldStar Studioworks monitors are fair choices and are well worth consideration.—*BB*

GoldStar Studioworks 76i. List price, \$850. **GoldStar Studioworks 78m.** List price, \$1,030. LG Electronics USA, Englewood Cliffs, NJ; 800-243-0000, 201-816-2000; www.lgeus.com. Circle 455 on reader service card.

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MAG InnoVision Co. Inc.

MAG DX700T



MAG InnoVision's MAG DX700T (\$799 list, \$700 street) is a moderately priced monitor suitable for the corporate desktop and even some image editing and DTP professionals. An all-around good performer, the MAG is a promising value.

The display is based on a 0.25-mm-pitch Trinitron aperture grille tube and includes digital controls with an on-screen display. We recommend working in 1,024-by-768 mode, in which it delivers a refresh rate of 85 Hz for a solid image. CAD users and graphics professionals can run the unit in 1,280-by-1,024 mode, though only at 65 Hz.

The DX700T did well in subjective hands-on tests. It was judged excellent or good in displaying many torture test images. Objectively, it scored in the excellent range on the Average MTF, Luminance, and Uniformity tests, earning a sixth-place MonMark score. Extra touches, such as a fully detailed and informative owner's manual and MAG's three-year warranty, help add value to the package. If you want pleasing image quality and features at a good price, put the MAG DX700T on your short list.—JRQ

MAG DX700T. List price: \$799. MAG InnoVision Co. Inc., Santa Ana, CA; 800-827-3998, 714-751-2008; www.maginnovision.com. Circle 456 on reader service card.

Magnavox

Magnavox CM4018

Marketed by the consumer products division of monitor giant Philips, the Magnavox CM4018 (\$749 list) is targeted toward the small business owner or home operator. The Magnavox unit we tested was an adequate performer, though you can find better image quality in a less-expensive unit from some other vendors in this roundup.

With a generous 16.2-inch viewable area, the unit employs a 0.28-mm shadow mask tube and offers a maximum resolution of 1,280-by-1,024, though most users will want to opt for 1,024-by-768 mode at a more ergonomic 75-Hz refresh rate. The on-screen controls were easy to use.

In subjective viewing, the Magnavox



Mitsubishi Diamond Scan 17HX, NEC MultiSync M700, Nokia Multigraph 447Xav.

showed some pincushioning and geometry distortion, and the objective results reflect these shortcomings. The focus matrix revealed disarrangement on the corners, but the image was noticeably clearer in the center. The monitor earned an excellent score on our Misconvergence test, though, and respectable scores on almost all the others.—HA

Magnavox CM4018. List price: \$749. Magnavox, Knoxville, TN; 800-531-0039, 423-521-4316; www.magnavox.com. Circle 457 on reader service card.

ManTech Solutions Corp.

InSync I1726

ManTech Solutions' InSync I1726 (\$699 list, \$670 street), one of the less-expensive monitors in this roundup, is intended for the home and SOHO market. You'll get better performance, though, from some of the other low-priced monitors reviewed here.

The InSync has a 0.26-mm-dot-pitch Hitachi shadow mask tube that delivers 1,024-by-768 resolution at a 76-Hz refresh rate. Basic user-adjustable settings are accessible via front-panel buttons.

In objective testing the InSync scored well on all pincushioning tests but poorly on the Average MTF and Misconvergence tests. In general, the monitor scored below average. Visually, there was a little pincushioning on the right-hand side, and the focus matrix was blurry in the center and lower edges. Colors were bright, but accuracy was a little suspect with greens and yellows.—HA

InSync I1726. List price: \$699. ManTech Solutions Corp., Springfield, VA; 800-246-7962, 703-913-2400; www.mtsol.com. Circle 458 on reader service card.

MiTAC

MiTAC MVM-L1766PD

The MiTAC MVM-L1766PD (\$649 list, \$580 street) is value-priced and targeted at home and SOHO users. The MiTAC landed at the bottom of the MonMark scores, and a better image can be had for just a little more money elsewhere.

The 0.28-mm-pitch aperture grill tube delivers 1,024-by-768 mode at 75 Hz (but note that the factory-preset rate is 72 Hz). With its somewhat limited screen controls, you can adjust the major geometric settings and set true-color mode via a single button. Another button displays the current refresh rate settings.

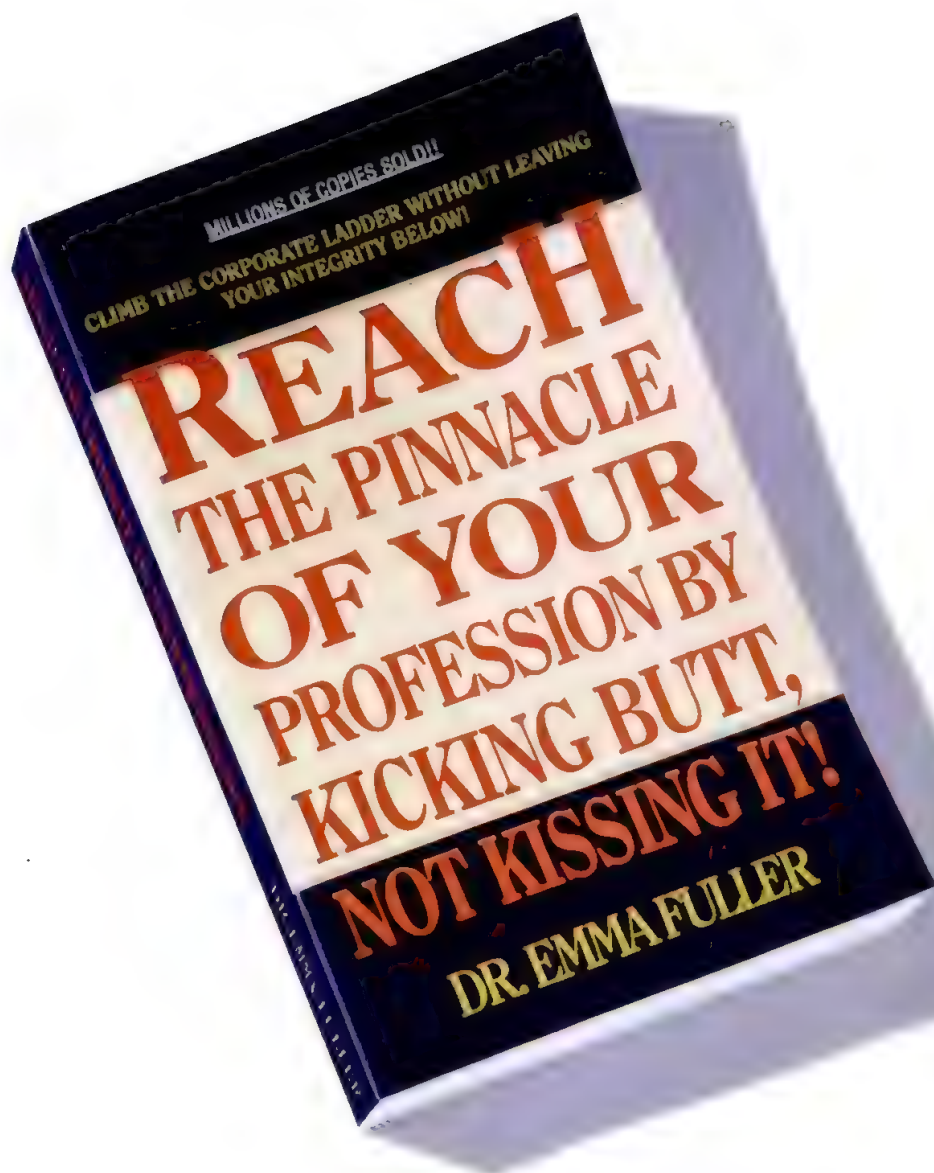
While the MiTAC scored among the top ten on our color range tests, most of its other scores were below average but still acceptable. The display's geometric control seemed fine in subjective testing, but the MiTAC's image bounced during screen-regulation tests. We noticed significant misconvergence in subjective testing. Color images appeared true but not as bright as those produced by many monitors here.—BB

MiTAC MVM-L1766PD. List price: \$649. MiTAC, Fremont, CA; 800-756-9888, 510-656-3333; www.mitac.mic.com. Circle 460 on reader service card.

Mitsubishi Electronics America Inc.

Diamond Scan 17HX

Designed for general business and graphics work, Mitsubishi Electronics America's Diamond Scan 17HX (\$799 list, \$720 street) has high-end controls and functionality. Our subjective impressions were positive, but beware of the mixed results on our objective tests.



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PERFORMANCE TESTS

17-Inch Monitors



This year we introduce our MonMark score for overall monitor performance. To help put the various objective test results in perspective, we created a composite weighting system for them and translated them into the single MonMark score.

What the Numbers Mean

A monitor is a complex, largely analog device. Many factors go into producing the image you see, and because improving one quality can degrade another quality slightly, each monitor design has its own balance.

To help you make sense of these sometimes conflicting test results, in this feature we introduce our MonMark score, a composite rating for monitors. This score, based on the various objective test results presented here, is an indication of the overall suitability of a monitor for a typical

business user. To calculate the MonMark, we weighted the individual objective scores according to how important they are to the average business user. For example, we gave the MTF (modulation transfer function, an indicator of sharpness) more weight than uniformity, since the sharpness of text is more important when you work mainly with programs such as word processors and spreadsheets. Color tracking and color range measurements are also factored into the MonMark score.

If you know which aspects of a monitor's performance are most important to you, the individual objective results will be just as useful as the composite score. Do note that objective test scores may appear to indicate a problem that is in fact not bothersome to the eye, as a result of an outstanding combination of other attributes.

	MONMARK	AVERAGE MTF	MISCONVERGENCE	HORIZONTAL PINCUSHIONING
	Score	Percent	Millimeters	Millimeters
Bold type denotes first place. AcerView 780e	169	59	0.14	0.17
ADI MicroScan SV	164	58	0.09	0.58
AOC Spectrum 7Nir	141	40	0.12	0.55
AppleVision 1710 Display	189	51	0.16	0.35
Compaq V70	182	62	0.06	0.15
Cornerstone Color 17/76	158	58	0.07	0.55
CTX VL700	179	75	0.07	0.41
CTX PR700	166	53	0.19	0.47
Deewoo CMC-1703B	147	42	0.10	0.32
Delta DB-1785EA	173	56	0.11	0.28
EIZO FlexScan T2-17TS	185	60	0.09	0.56
EIZO FlexScan TX-C7S	185	62	0.12	0.39
GVC Maxtech XT-7800	159	53	0.12	0.51
Hitachi Accuvue GX17L	160	52	0.10	0.36
Hyundai DeluxScan 17B	169	60	0.12	0.40
Iiyama Vision Master Pro 17	167	73	0.12	0.63
KDS Visual Sensations VSx-7	145	44	0.11	0.72
LG Goldstar Studioworks 78i	162	64	0.19	0.45
LG Goldstar Studioworks 78m	168	66	0.09	0.80
MAG DX700T	180	63	0.13	0.30
Magnovox CM4018	157	55	0.10	0.58
ManTech InSync II726	153	49	0.14	0.16
MITAC MVM-L1706PD	140	56	0.13	0.60
Mitsubishi Diamond Scan 17HX	163	52	0.13	0.68
NEC MultiSync M700	164	80	0.09	0.32
	BETTER >	BETTER >	< BETTER	< BETTER

Among the individual scores, the Average MTF score may be the most important to mainstream business users. The Average MTF measures the contrast between closely spaced lines and is an indication of the monitor's sharpness. A higher score here reflects a better ability to represent fine detail, most noticeable in the crisp display of text. A score above 60 percent is excellent; a monitor that scored below 45 percent is generally not recommended for intensive writing work. Over half of the monitors tested had excellent MTF scores, with the NEC MultiSync M700 leading the field. Three units—the AOC Spectrum 7Nir, Daewoo CMC-1703B, and KDS Visual Sensations VSx-7—had less-than-acceptable showings.

A monitor displays color by exciting red, green, and blue phosphors with electron beams. When these beams are misaligned,

colored halos appear around displayed objects. This is called *misconvergence* and is usually most apparent near the edges of the screen, where the electron beams are at their greatest deflection. Over the past few years, we've seen misconvergence become less of a problem as 17-inch displays improve.

Pincushioning is a measure of how much a straight line curves or bows on-screen. Lines at the edges of the screen tend to exhibit more pincushioning than lines at the center because of the increased deflection of the electron beam. On the Horizontal Pincushioning test, 28 monitors scored in the excellent range, with pincushioning of 0.45 mm or less; the Sony Multiscan s11 led the pack with an imperceptible 0.10 mm of pincushioning. Four units had noticeable pincushioning that fell above our acceptable cutoff of 0.65 mm. For the Vertical Pincush-

ioning test, we first adjusted the pincushioning (on monitors that offered this control) to obtain the straightest lines. More than half of the monitors had excellent ratings on this test, with errors of less than 0.35 mm; four models had more than 0.55 mm of error, which we considered unacceptable.

Luminance is a standard measurement of the average perceived brightness of a monitor in controlled external conditions. A higher score indicates that a unit can produce a brighter image without bringing the black areas to gray, which would lower the sharpness and contrast. Eight units scored at or above 35 fL (foot-lamberts), which we considered excellent. None scored below 18 fL, which would have been unacceptable.

Uniformity is a measure of how luminance and color vary across the display. A monitor with brighter or darker patches, or whose color varies from one area to another, would receive a poorer uniformity score. 21 monitors had excellent scores (less than 7 percent variability); all of the others were acceptable. The most uniform monitor was the Apple Vision 1710 Display, followed closely by the Sony Multiscan s11 and the Eizo FlexScan TX-C7S.—Analysis written by Brian Fikes

How We Tested

ZD Labs recently upgraded to the Microvision SuperSpot 200, which we used to measure modulation transfer function, misconvergence, and pincushioning. The new system lets us automate more of the testing and gives us accurate and replicable results. We used the SuperSpot's built-in video generator card (a Quantum Data Model 801GF-ISA), set to the VESA standard timing of 1,024 by 768 pixels at a 75-Hz vertical refresh rate, to output the test patterns for all of the objective tests. We used a Minolta Color Analyzer CA-100 to measure luminance, color temperature, color range, color tracking, and uniformity of both luminance and color over the entire screen area.

For subjective tests, we used HP Vectra XU 5/90Cs with Number Nine Imagine 128 video cards capable of displaying 24-bit color at the same VESA 1,024-by-768 timing. We viewed test patterns generated from Sonera's DisplayMate video display utilities for Windows and also looked at high-quality photo images using Adobe PhotoShop 3.0.5. Each reviewer followed the same script and looked for the same qualities in each pattern and image, so that the evaluations would be as comparable as possible. We required each of the reviewers in our subjective jury to pass an eye exam, which measured whether the

Continues

VERTICAL PINCUSHIONING

Millimeters

0.20

0.69

0.33

0.36

0.55

0.41

0.22

0.23

0.43

0.28

0.51

0.34

0.45

0.28

0.17

0.35

0.30

0.26

0.31

0.28

0.50

0.25

0.36

0.14

0.42

LUMINANCE

Foot-lamberts

25.7

33.9

25.0

48.7

24.4

24.8

31.7

31.5

30.0

32.2

33.5

35.4

37.8

23.1

27.7

24.5

32.2

29.1

32.5

43.2

31.8

24.4

28.5

35.0

27.7

COLOR AND LUMINANCE UNIFORMITY

Score

9.0

6.3

12.6

4.3

6.8

6.4

10.1

4.8

10.3

5.1

7.2

4.4

9.8

5.6

6.9

5.8

9.4

8.8

6.6

6.8

7.8

10.1

11.2

10.6

13.6

◀ BETTER

BETTER ▶

◀ BETTER

PERFORMANCE TESTS

Continued

reviewer's color sensitivity and acuity were within normal limits. These tests were prescribed by and performed under the direction of Dr. Mark Grisar, O.D., president of Yonkers (New York) Eye Exam. This included the Farnsworth D-15, the Pseudo-Isochromatic Plates Test, and screening tests for both the visual fields and contrast sensitivity.

The **MonMark** score, a weighted compos-

ite of the other six test scores, is described above. To measure **Average MTF**, we displayed on each monitor a pattern of alternating *on* and *off* lines, 1 pixel wide, in both the horizontal and vertical directions. We report the average of the horizontal and vertical test results, measured both at the center and at one corner of the screen.

For the **Misconvergence** test, we measured the beam displacement between red, green,

and blue pixels near each corner and at the center of the display, in both the horizontal and vertical directions. We report the root mean square (RMS) of these results.

The **Vertical Pincushioning** and **Horizontal Pincushioning** tests measure the amount of curvature of lines placed at the center and edges of the display. We report the root mean square (RMS) of these results. For the **Luminance** test we measured a unit's bright-

	MONMARK	AVERAGE MTF	MISCONVERGENCE	HORIZONTAL PINCUSHIONING
	Score	Percent	Millimeters	Millimeters
Bold type denotes first place.				
NEC MultiSync XV17+	167	60	0.09	0.20
Nokia Multigraph 447Xav	176	67	0.09	0.25
Nokia Multigraph 447XI	156	60	0.13	0.31
NSA/Hitachi SuperScan Elite 17	172	64	0.06	0.33
Optique Value Line V775	163	60	0.12	0.50
Pacom 7Fgs	166	51	0.16	0.27
Panasonic PanaSync S17	166	64	0.11	0.36
Panasonic PanaSync Pro P17	165	72	0.11	0.50
Pixie PBC-1764	165	61	0.11	0.48
Portrait Displays Pivot 1700	151	62	0.13	0.51
Princeton Ultra 17+	146	51	0.15	0.90
Sampo Alpha Scan 760	163	67	0.12	0.65
Samsung SyncMaster 17GLJ	179	57	0.07	0.30
Samtron SC-726GXL	165	55	0.11	0.28
Sceptro WINplay P73A	165	58	0.08	0.59
Sigma ErgoView 170	148	53	0.09	0.56
Smile CB1716SL	166	67	0.09	0.40
Sony Multiscan 17sf II	199	61	0.08	0.10
Sony Multiscan 17se II	188	70	0.13	0.32
techmedia TCM-1700G	186	63	0.11	0.27
Viewsonic 17EA	180	73	0.11	0.43
Viewsonic PT770	173	56	0.08	0.31
WYSEvision WY-17PS	173	66	0.11	0.30
ZDS Z-Vision ZCM-1750-UT	171	59	0.14	0.24

BETTER ▶

BETTER ▶

◀ BETTER

◀ BETTER

Based on a flat-square CRT with a 0.26-mm dot pitch, the Diamond Scan can be pushed up to a resolution of 1,600-by-1,200 with a vertical refresh rate of 66 Hz; 1,280-by-1,024 can be had at a refresh rate of 75 Hz. Its flip-down control panel has simple membrane buttons, and the on-screen menus are easy to manage.

In brightness and color accuracy, the Diamond Scan was exceptional. Color

images looked photorealistic. Unfortunately, some misconvergence and horizontal pincushioning handicapped overall performance, landing the unit in the bottom tier of the monitors tested.—**JRQ**
Diamond Scan 17HX. List price: \$799. Mitsubishi Electronics America Inc., Cypress, CA; 800-843-2515; www.mitsubishi-display.com. Circle 461 on reader service card.

NEC Technologies Inc.

NEC MultiSync M700, NEC MultiSync XV17+

The NEC MultiSync M700 (\$900 street), with NEC Technologies' new ChromaClear CRT slot mask technology and integrated speakers, is positioned as a corporate mainstream multimedia monitor. The NEC MultiSync XV17+ (\$850 street) tar-

HARDWARE

17-Inch Monitors

ness at the center of an all-white screen. Before taking any measurements, we set the brightness so that a black screen reads 0.06 fL at the center, which looks black in a room with normal lighting, and we set the contrast so that a white screen is just below the brightest setting. This generally gives the best appearance and the best overall test scores. So although each monitor could have been placed at a slightly brighter setting, the

luminance score measures the brightest the monitor can be while still maintaining the best possible overall scores. The **Color and Luminance Uniformity** test measures how the luminance and color of a monitor vary across the display area. Screen regulation, a subjective test, measures the ability of a monitor to compensate for the tendency of brighter areas of a CRT image to expand and of darker areas to contract.

VERTICAL PINCUSHIONING

Millimeters

LUMINANCE

Foot-lamberts

COLOR AND LUMINANCE UNIFORMITY

Score

0.43	34.0	8.5
1.02	29.4	6.5
1.11	30.6	9.3
0.37	34.7	8.3
0.21	31.4	8.3
0.16	30.9	7.5
0.28	34.7	11.0
0.23	31.6	11.2
0.18	28.1	7.7
0.31	32.0	12.2
0.42	33.1	9.6
0.20	24.5	7.8
0.26	34.6	6.8
0.29	29.4	6.8
0.40	27.2	7.8
0.32	23.1	10.0
1.03	31.2	6.5
0.40	34.1	6.6
0.41	34.1	4.4
0.31	30.1	6.2
0.37	30.4	6.9
0.34	39.5	6.6
0.38	32.2	6.5
0.47	44.1	11.3

◀ BETTER

BETTER ▶

◀ BETTER

gets those who work on office-productivity apps. Both meet the needs of their markets, but neither is a class leader.

NEC claims the CromaClear tube delivers a sharper picture, and the M700 (with a rated 0.25-mm mask pitch) was unbeaten on our Average MTF test, a measure of image crispness. Most other objective results placed the unit in the middle of the pack. In subjective evaluation, the

color and photographic images focused well but didn't seem as bright as most.

Size-adjustable video boost mode increases brightness and contrast for video display. Maximum display resolution for the M700 is 1,280-by-1,024 at 65 Hz; a more flicker-free 86-Hz refresh rate can be had in 1,024-by-768 mode. The M700's 2.5-watt speakers are acceptable for individual use but easily driven to distortion.

The XV17+ is a shadow mask monitor with a 0.28-mm dot pitch. On the objective tests, the XV17+ earned excellent scores for misconvergence and horizontal pincushioning. Most other results were average or a little below average for the group. The XV17+'s subjective test performance was disappointing. Sharpness, resolution, and convergence were all off. For looking at color graphics and photographic images, however, the XV17+ was competitive.

Mainstream business users will probably be satisfied with either NEC display. But graphics professionals should seek out other monitors.—BB

NEC MultiSync M700. Street price: \$900. **NEC MultiSync XV17+.** Street price: \$850. NEC Technologies Inc., Boxborough, MA; 800-632-4636, 508-264-8000; www.nec.com. Circle 462 on reader service card.

Nokia Display Products Inc.

Nokia Multigraph 447Xav, Nokia Multigraph 447Xi

Intended for CAD, DTP, and mainstream corporate professionals, the Nokia Multigraph 447Xav (\$999 list, \$950 street) and 447Xi (\$899 list, \$850 street) deliver a good range of features and solid—if not stellar—image attributes.

In terms of display features, the two models are virtually identical. Both Multigraphs use a Trinitron tube with a 0.25-mm aperture grille. Both have digital controls with sophisticated features, and both come with Colorific software. Each enables you to display a 1,600-by-1,200 image at an outstanding vertical refresh rate of 72 Hz—among the best here.

The Multigraph 447Xav justifies its extra cost with built-in speakers, which have a subwoofer incorporated into the swivel base. While not as good as a stand-alone three-piece speaker system, the sound quality is one of the best implementations we've heard from integrated speakers and is appropriate for business tasks. Nokia plans to introduce a built-in video camera option (\$500) that will be available by the time you read this.

The Multigraph 447Xav scored well above average overall, placing in the top ten in our MonMark rankings. The 447Xi didn't fare as well, placing in the middle of the field. Both monitors exhibited vertical pincushioning problems that could not be

SUMMARY OF FEATURES

17-Inch Monitors

PC MAGAZINE
EDITORS' CHOICE

	Acer America Corp. AcerView 700	ADI Systems Inc. ADI MicroScan 5V	AOC International (USA) Ltd. AOC Spectrum 700r	Apple Computer Inc. AppleVision 1710 Display	Compaq Computer Corp. Compaq V70	Cornerstone Imaging Inc. Cornerstone Color 17/76	CTX International Inc. CTX VL700	CTX International Inc. CTX PR700
■ YES ■ NO □ OPTIONAL								
In alphabetical order by company								
List/street price	None/\$800	\$899/\$740	\$749/\$570	None/\$970	None/\$730	\$895/\$800	\$755/\$660	\$999/\$890
Tube type	Shadow mask	Shadow mask	Shadow mask	Aperture grille	Shadow mask	Shadow mask	Shadow mask	Aperture grille
Dot, grille, or mask pitch (millimeters)	0.26 (dot)	0.28 (dot)	0.26 (dot)	0.25 (grille)	0.28 (dot)	0.26 (dot)	0.28 (dot)	0.25 (grille)
Viewable screen size (diagonal, in inches)	15.6	15.9	15.8	16.1	15.5	15.8	16.0	16.2
Monitor dimensions (HWD, in inches)	16.5 x 16.5 x 16.7	16.4 x 16.2 x 17.1	15.7 x 15.5 x 17.5	17 x 16.3 x 18	17.4 x 16.6 x 17.7	16.9 x 16.0 x 18.3	16.8 x 16.1 x 16.4	17.0 x 16.4 x 17.5
MPRI/TCO	■ □	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Plug-and-play (DDC-1 and -2B)	■	■	■	■	■	■	■	■
Antiglare treatment	AR coating	AR coating, dark glass	Silica	Dark glass, silica	AR coating	AR coating	AR coating	AR coating
Maximum noninterlaced vertical refresh rate:								
1,600 x 1,200	68 Hz	N/A	65 Hz	N/A	N/A	68 Hz	N/A	65 Hz
1,280 x 1,024	80 Hz	60 Hz	75 Hz	75 Hz	60 Hz	76 Hz	60 Hz	75 Hz
1,024 x 768	106 Hz	76 Hz	75 Hz	75 Hz	85 Hz	90 Hz	75 Hz	75 Hz
800 x 600	106 Hz	100 Hz	75 Hz	75 Hz	85 Hz	112 Hz	75 Hz	75 Hz
640 x 480	100 Hz	120 Hz	75 Hz	75 Hz	75 Hz	75 Hz	75 Hz	75 Hz
Controls								
On-screen display	■	■	■	■	■	■	■	■
Brightness/Contrast	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Horizontal position/Vertical position/Size	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Pincushion/Pincushion balance	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Trapezoid/Parallelogram	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Tilt or rotation/Convergence	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
RGB color adjustment	■	■	■	■	■	■	■	■
Color temperature presets	■	■	■	■	■	■	■	■
Connections and Accessories								
Permanently attached video-input connection	■	■	■	■	■	■	■	■
DB-15 VGA/BNC-5	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Universal serial bus	■	■	■	■	■	■	■	■
Speakers	■	■	■	■	■	■	■	■
Line in/Microphone in	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Warranty								
Warranty (CRT, parts, and labor)	1 year	2 years	3 years	1 year	3 years	3 years	3 years	3 years
Free next-business-day exchange	■	■	■	■	■	■	■	■
N/A—Not applicable. The product does not have this feature.								

corrected, and their scores here were unacceptable. Photographic images were crisp and clear, however.—*JRQ*

Nokia Multigraph 447Xav. List price: \$999.
Nokia Multigraph 447Xi. List price: \$899. Nokia Display Products Inc., Sausalito, CA; 800-296-6542, 415-331-4244; www.nokia.com. Circle 463 on reader service card.

NSA/Hitachi

SuperScan Elite 17

Targeted at mainstream business users and image-editing professionals, NSA/Hitachi's SuperScan Elite 17 is a precise display with some impressive test results. List-priced at \$975 but available through retailers at a competitive \$880, it

is a consistent performer.

Made by Hitachi for the U.S.-based NSA/Hitachi subsidiary, this monitor is based on a flat-square CRT with a fine 0.26-mm dot pitch. The Elite 17 has a maximum recommended resolution of 1,280-by-1,024 with a vertical refresh rate of 75 Hz. Up-front digital controls give access to a range of advanced image attributes.

On both subjective and objective tests, details in color and high-resolution graphic images showed up well, and the monitor delivered the best Misconvergence scores of all the displays we tested. Overall, it scored better than average and delivered bright images. Note that NSA/Hitachi will be upgrading this monitor and changing its name to the SuperScan CM611-511

by our publication date.—*JRQ*
SuperScan Elite 17. List price: \$975. NSA/Hitachi, Westwood, MA; 800-441-4832; www.nsa-hitachi.com. Circle 464 on reader service card.

Optiquequest by ViewSonic Corp.

Optiquequest Value Line V775



A solid all-around entry, the Optiquequest Value Line V775 (\$699 list, \$650 street) delivers a lot of value and merits an Editors' Choice. Made by ViewSonic Corp., the Optiquequest V775 proves a good buy for corporate, SOHO, and home desktops.

SUMMARY OF FEATURES

17-Inch Monitors



■ YES ■ NO □ OPTIONAL
in alphabetical order by company

	LG Electronics USA GoldStar Studioworks 78m	MAG InnoVision Co. Inc. MAG DX700T	Magnavox CM4018	ManTech Solutions Corp. InSync 11726	MITAC MITAC MVM- L1766PD	Mitsubishi Electronics America Inc. Diamond Scan 17HX	NEC Technologies Inc. NEC MultiSync M700	NEC Technologies Inc. NEC MultiSync XV17+
List/street price	\$1,030/\$880	\$799/\$700	\$749/\$620	\$699/\$670	\$649/\$580	\$799/\$720	None/\$900	None/\$850
Tube type	Shadow mask	Aperture grille	Shadow mask	Shadow mask	Aperture grille	Shadow mask	Slot mask	Shadow mask
Dot, grille, or mask pitch (millimeters)	0.26 (dot)	0.26 (grille)	0.28 (dot)	0.26 (dot)	0.28 (grille)	0.26 (dot)	0.25 (mask)	0.28 (dot)
Viewable screen size (diagonal, in inches)	16.0	16.1	16.2	15.9	15.8	15.7	15.4	15.5
Monitor dimensions (HWD, in inches)	17.3 x 19.3 x 16.3	16.6 x 16.1 x 17.7	16.7 x 16.6 x 17.3	16.7 x 16.5 x 13.5	17.0 x 15.7 x 16.7	16.0 x 16.0 x 16.6	17.3 x 16.0 x 17.7	16.5 x 15.9 x 19.3
MPRII/TCO	■	■ □	■	■	■	■	■	■ □
Plug-and-play (DDC-1 and -2B)	■	■	■	■	■	■	■	■
Antiglare treatment	AR coating, dark glass	AR coating	Dark glass, silica	Dark glass, silica	AR coating	AR coating	AR coating	AR coating
Maximum noninterlaced vertical refresh rate								
1,600 x 1,200	60 Hz	N/A	N/A	N/A	N/A	66 Hz	N/A	N/A
1,280 x 1,024	77 Hz	65 Hz	60 Hz	60 Hz	60 Hz	75 Hz	65 Hz	60 Hz
1,024 x 768	80 Hz	85 Hz	75 Hz	76 Hz	75 Hz	100 Hz	86 Hz	81 Hz
800 x 600	>100 Hz	108 Hz	75 Hz	76 Hz	72 Hz	130 Hz	110 Hz	103 Hz
640 x 480	>100 Hz	120 Hz	75 Hz	76 Hz	72 Hz	130 Hz	120 Hz	100 Hz
Controls								
On-screen display	■	■	■	■	■	■	■	■
Brightness/Contrast	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Horizontal position/Vertical position/Size	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Pincushion/Pincushion balance	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Trapezoid/Parallelogram	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Tilt or rotation/Convergence	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
RGB color adjustment	■	■	■	■	■	■	■	■
Color temperature presets	■	■	■	■	■	■	■	■
Connections and Accessories								
Permanently attached video-input connection	■	■	■	■	■	■	■	■
DB-15 VGA/BNC-5	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Universal serial bus	■	■	■	■	■	■	■	■
Speakers	■	■	■	■	■	■	■	■
Line in/Microphone in	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Warranty								
Warranty (CRT, parts, and labor)	3 years	CRT, 2 years; parts, 3 years; labor, 1 year	CRT and parts, 3 years, labor, 2 years	3 years	CRT and parts, 3 years, labor, 1 year	3 years	3 years	3 years
Free next-business-day exchange	■	■	■	■	■	■	■	■

N/A—Not applicable. The product does not have this feature.

Pacom 7Fgs. List price: \$749. Pacom Data Inc., Fremont, CA; 800-820-7226, 510-440-7200; www.pacomdata.com/. **Circle 465 on reader service card.**

Panasonic Computer Peripheral Co.

PanaSync S17, PanaSync Pro P17



Panasonic's PanaSync Pro P17 (\$949 list, \$850 street) is a fine selection for demanding graphics- and video-intensive applications. The PanaSync S17 (\$799 list, \$670 street) is a good midrange performer for home and SOHO users.

The PanaSync Pro P17 has a DQ-

DAF (Double-Quadrupole, Dynamic Astigmatism and Focus) gun tube, which utilizes two lens layers in order to create a rounder dot. The rounder dot, plus a smaller-than-average dot pitch—0.25 mm—give the images much greater sharpness. Four buttons work in conjunction with a 19-item on-screen menu to deliver control of almost every image attribute.

On our subjective tests, the Pro P17's images were clearly focused and registered bright, true colors. Its objective scores were a mix of average and above average, though a relatively low Uniformity score brought down its overall MonMark score.

The PanaSync S17, which also uses a

DQ-DAF tube, has a 0.27-mm dot pitch and delivers 1,024-by-768 resolution at 85 Hz. The S17 is easy to adjust, with on-screen menus and controls. It made an excellent showing on our Average MTF test, and its MonMark rating ranked above that of most like-priced units. Overall, it delivered sharp, bright images and colors that should suit productivity application chores. Both Panasonic monitors meet the needs of their target markets.—BB

PanaSync S17. List price: \$799. **PanaSync Pro P17.** List price: \$949. Panasonic Computer Peripheral Co., Secaucus, NJ; 800-742-8086, 201-392-4812; www.panasonic.com. **Circle 466 on reader service card.**

Continues

[illegible]**PiXie PBC-1764**

The PiXie PBC-1764 (\$600 street) is intended for undemanding home applications. If you want a larger display for gaming and home use and are on a tight budget, this is an adequate choice.

The PBC-1764 has a 0.28-mm-dot-pitch shadow mask tube and delivers 1,024-by-768 resolution at a respectable 85-Hz refresh rate. Monitor control settings are adjusted via a series of buttons on front.

On our subjective testing, the PBC-1764's geometry and colors seemed fine, but the screen regulation was off. There were also noticeable convergence problems. The unit was among the top ten on

the Vertical Pincushioning test but among the bottom ten on our color tracking and Luminance measures. Color images and photographs seemed a bit out of focus and not as bright as on other monitors. The PiXe PBC-1764 is unexceptional but acceptable for an entry-level user.—*BB*

PiXie PBC-1764. Street price: \$600. PiXie Technologies Inc., Fremont, CA; 800-440-7211, 510-440-9721. *Circle 467 on reader service card.*

Portrait Displays Inc.

Pivot 1700

Portrait Displays' Pivot 1700 is perfect for people who work on Web pages or on word processing documents and need to

see a full 8.5- by 11-inch page on a 17-inch monitor. The entire display can rotate clockwise 90 degrees so you can switch between landscape and portrait orientations



SUMMARY OF FEATURES

17-Inch Monitors



	Sampo Technology Inc. Sampo Alpha- Scan 760	Samsung Electronics America Inc. SyncMaster 17GLi	Samtron Samtron SC- 726GXL	Sceptre Technologies Inc. Sceptre WINplay P73	Sigma Sigma Ergoview 170	Smile International Inc. Smile CB1716SL	Sony Electronics Inc. Sony Multiscan 17sf II
■ YES ■ NO □ OPTIONAL							
In alphabetical order by company							
List/street price	\$949/\$845	\$779/\$710	\$869/\$790	\$849/\$750	\$999/\$700	\$699/\$630	\$879/\$800
Tube type	Aperture grille	Shadow mask	Shadow mask	Shadow mask	Shadow mask	Shadow mask	Aperture grille
Dot, grille, or mask pitch (millimeters)	0.25 (grille)	0.28 (dot)	0.26 (dot)	0.28 (dot)	0.27 (dot)	0.28 (dot)	0.25 (grille)
Viewable screen size (diagonal, in inches)	16.1	15.8	15.8	15.9	15.4	15.8	16.0
Monitor dimensions (HWD, in inches)	16.1 x 17.9 x 15.8	16.5 x 16.9 x 17.3	16.5 x 16.8 x 17.3	16.5 x 16.1 x 17.1	16.7 x 16.6 x 17.3	16.0 x 16.5 x 16.5	16.8 x 15.9 x 17.7
MPRII/TCO	■ ■	■ ■	■ ■	■ □	■ ■	■ ■	■ ■
Plug-and-play (DDC-1 and -2B)	■	■	■	■	■	■	■
Antiglare treatment	AR coating	AR coating	Silica	Silica	AR coating	AR coating	AR coating
Maximum noninterlaced vertical refresh rate							
1,600 x 1,200	65 Hz	N/A	66 Hz	N/A	65 Hz	N/A	N/A
1,280 x 1,024	76 Hz	60 Hz	80 Hz	65 Hz	76 Hz	60 Hz	60 Hz
1,024 x 768	100 Hz	80 Hz	105 Hz	86 Hz	100 Hz	76 Hz	80 Hz
800 x 600	120 Hz	100 Hz	120 Hz	100 Hz	120 Hz	90 Hz	95 Hz
640 x 480	120 Hz	120 Hz	120 Hz	120 Hz	120 Hz	100 Hz	120 Hz
Controls							
On-screen display	■	■	■	■	■	■	■
Brightness/Contrast	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Horizontal position/Vertical position/Size	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Pincushion/Pincushion balance	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Trapezoid/Parallelogram	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Tilt or rotation/Convergence	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
RGB color adjustment	■	■	■	■	■	■	■
Color temperature presets	■	■	■	■	■	■	■
Connections and Accessories							
Permanently attached video-input connection	■	■	■	■	■	■	■
DB-15 VGA/BNC-5	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Universal serial bus	■	■	■	■	■	■	■
Speakers	■	■	■	■	■	■	■
Line in/Microphone in	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Warranty							
Warranty (CRT, parts, and labor)	2 years	3 years	CRT, 2 years; parts and labor, 3 years	CRT and parts, 3 years, labor, 1 year	1 year	3 years	CRT, 2 years, parts and labor, 3 years
Free next-business-day exchange	■	■	■	■	■	■	■

N/A—Not applicable. The product does not have this feature.

on the fly, with no need to reboot. The Pivot 1700 showed average overall performance, and it's clear you are getting the mechanics of the display and not top-tier image quality for your \$1,000 (\$1,099 list).

The Pivot employs a 0.26-mm shadow mask tube, and its 15 buttons for screen adjustments (each with four function levels) give users a lot of control over screen geometry and color. Top resolution is 1,280-by-1,024, though 1,024-by-768 mode at a 75-Hz refresh rate is recommended.

On objective tests the Pivot 1700 was a middling performer. There was noticeable misconvergence. Colors were good, though not competitive with those of the highest performers. Terrific for full-page environments, the Pivot 1700 is worth the

price if you need portrait mode.—**BB**

Pivot 1700. List price: \$1,099. Portrait Displays Inc., Pleasanton, CA; 800-858-7744, 510-227-2700; www.portrait.com. Circle 468 on reader service card.

Princeton Graphic Systems

Princeton Ultra 17+

With some high-end features but a low-end price, the Princeton Ultra 17+ (\$629 list, \$600 street) might suit business and home users. But lackluster performance on our objective and subjective tests means graphics pros will want to look elsewhere. Princeton is a division of MAG InnoVision.

The Ultra 17+ comes with some fea-

tures you'd expect in a more expensive monitor. You'll find color controls here, for example, and the monitor can produce a 1,280-by-1,024 image with a vertical refresh rate of 75 Hz. On the other hand, it is based on a standard 0.28-mm-dot-pitch flat-square tube.

On our objective tests, the Princeton Ultra 17+ suffered from very severe misconvergence and horizontal pincushioning. In eyes-on tests, this translated into a lack of crispness and noticeable deviations in some straight lines on-screen. This combination of difficulties meant that the Princeton monitor landed near the bottom on our overall MonMark rankings.

Although the price and added features may be attractive, on the whole the Ultra

Ends

Sony Electronics
Inc.
**Sony Multiscan
17se II**

techmedia
Computer
Systems Corp.
**techmedia
TCM-1700G**

ViewSonic Corp.
**ViewSonic
17EA**

ViewSonic Corp.
**ViewSonic
PT770**

WYSE
Technology Inc.
**WYSEvision
WY-17PS**

Zenith Data
Systems
**Z-Vision ZCM-
1750-UT**

\$1,099/\$1,000

Aperture grille
0.25 (grille)

16.0

16.8 x 15.9 x 17.7

AR coating

60 Hz

78 Hz

100 Hz

120 Hz

150 Hz

\$699/\$600

Shadow mask
0.28 (dot)

15.8

16.0 x 15.8 x 16.8

AR coating

N/A

60 Hz

75 Hz

75 Hz

75 Hz

\$699/\$645

Shadow mask
0.28 (dot)

15.9

16.8 x 16.2 x 18.2

Dark glass, silica

N/A

65 Hz

85 Hz

108 Hz

120 Hz

\$895/\$845

Aperture grille
0.25 (grille)

16.0

16.7 x 16.1 x 17.1

AR coating

66 Hz

77 Hz

101 Hz

120 Hz

120 Hz

\$995/\$920

Aperture grille
0.25 (grille)

16.2

16.7 x 10.6 x 17.1

Antielectrostatic

60 Hz

74 Hz

76 Hz

75 Hz

75 Hz

\$829/\$795

Shadow mask
0.26 (dot)

16.1

17.2 x 16.5 x 18.5

AR coating

60 Hz

75 Hz

100 Hz

100 Hz

100 Hz

CRT, 2 years;
parts and labor,
3 years

CRT and labor
1 year; parts,
3 years

</

17+ is a disappointment. —JRQ

Princeton Ultra 17+. List price: \$629. Princeton Graphic Systems, Santa Ana, CA; 800-747-6249, 714-751-8405; www.pgr.com. *Circle 469 on reader service card.*

Sampo Technology Inc.

Sampo AlphaScan 760

The Sampo AlphaScan 760 (\$949 list, \$845 street) is targeted at corporate and SOHO users, and it should fit the needs of most of these users well.

The AlphaScan 760 uses a 0.25-mm DiamondTron aperture grille tube and supports up to 1,600-by-1,200 resolution at 65 Hz or 1,280-by-1,024 at 76 Hz. There are plenty of easy-to-use controls in its on-

screen menu. It has one of the largest viewable areas (16.1 inches) of the group but also has the shortest video cable (42 inches). Fortunately, this cable is not permanently attached, so you can replace it with a longer one, if necessary. Weighing in at a hefty 52.9 pounds, this monitor was the heaviest in our roundup. Sampo Technology says it has one of the best MTBF figures in the industry, and the company provides a two-year warranty that covers parts, labor, and the CRT.

The display was sharp and had good color quality. There were noticeable mis-convergence, pincushioning, and linearity errors that could not be corrected with the controls, but none of these were very large. This monitor should serve the needs of

most corporate and SOHO users.—**BF Sampo AlphaScan 760.** List price: \$949. Sampo Technology Inc., Norcross, GA; 770-449-6220; www.marshall.com/. *Circle 470 on reader service card.*

Samsung Electronics America Inc.

SyncMaster 17GLi

PC
MAGAZINE
EDITORS'
CHOICE

The SyncMaster 17GLi (\$779 list, \$710 street) was last year's Editors' Choice for mainstream business use. Samsung Electronics America has changed this year's package only slightly, adding both Colorific software and adapters for Macintosh support. The unit is still a standout monitor, with a great mix of features and performance for a very competitive price.

The 17GLi has a 0.28-mm-dot-pitch shadow mask tube. The unit can be run at 1,280-by-1,024, though only at 60 Hz; 1,024-by-768 can be obtained at 80 Hz. The controls are well designed, with clear icons on a handsome drop-down panel. The monitor delivered some of the better colors we saw in this roundup. Our photo image tests showed good depth of color, with some warmth, and excellent screen uniformity and geometry.

The 17GLi delivers great value for the demanding but cost-conscious business user or desktop publisher.—SB

SyncMaster 17GLi. List price: \$779. Samsung Electronics America Inc., Ridgefield Park, NJ; 800-726-7864, 201-229-4000; www.sosimple.com. *Circle 471 on reader service card.*

Samtron

Samtron SC-726GXL

Samtron focuses its attention on the mainstream business user and DTP professional with the Samtron SC-726GXL. Reasonably priced at around \$790 (\$869 list), this monitor consistently scored well on almost all of our tests.

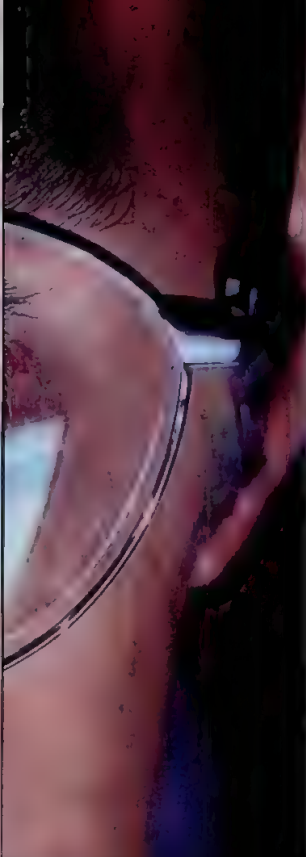
The SC-726GXL has a 0.26-mm-dot-pitch shadow mask CRT. Maximum resolution is an impressive 1,600-by-1,200, though only at a 66-Hz refresh rate; 1,280-by-1,024 mode at 80 Hz is preferable.

The unit's objective test scores were almost all above average; the SC-726XL



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It has features that will put it high on the wish list of everyone in the company. The larger screen means applications won't have to be scrolled back and forth so much or reduced to eye-straining proportions. It also has an extremely fine dot pitch and high resolutions for crisp, sharp images and on-screen controls that allow for very easy and precise adjustments. What's more, the highest refresh rate in its price range keeps the screen flicker-free. In fact, for the money, you won't find another monitor with such an impressive list of features. Go ahead, look around. For more information, call 1-800-818-9088 or visit us at www.compaq.com.

COMPAQ

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fell behind only on the Luminance and Average MTF tests. Subjectively, the SC-726GXL performed quite well on all three geometry and distortion tests. Sharpness and resolution were fine, though our test boxes were slightly elongated at the outer edges on the resolution matrix test. Colors were a little dark, with reds showing inconsistencies. Still, this proves a fine purchase for general use.—*HA*

Samtron SC-726GXL. List price: \$869. Samtron, Ridgefield, NJ; 800-933-4110. Circle 472 on reader service card.

Sceptre Technologies Inc.

Sceptre WINplay P73A

Sceptre Technologies' Sceptre WINplay P73A (\$849 list, \$750 street price) is a moderately priced monitor suitable for the mainstream business user. But it was not a standout on our tests.

Based on a standard 0.28-mm-dot-pitch shadow mask CRT, the Sceptre scored very well on our Misconvergence test but was in the bottom tier on our Horizontal Pincushioning, color tracking, and Luminance measures. On our subjective evaluation, the Sceptre unit had acceptable horizontal-line resolution clarity and colors appeared true, but an overall lack of brightness was disturbing. Color photographs appeared less crisp than they did on many of the other monitors we tested.

The Sceptre P73 is satisfactory, but \$750 can buy a better unit today.—*BB*

Sceptre WINplay P73A. List price: \$849. Sceptre Technologies Inc., City of Industry, CA; 800-788-2878, 818-369-3698; www.sceptretech.com. Circle 473 on reader service card.

Sigma

Sigma Ergoview 170

The Sigma Ergoview 170 (\$999 list, \$700 street) offers a good range of features at an attractive price. It wasn't the strongest performer in our group, however.

The Ergoview has a shadow mask tube with a 0.27-mm dot pitch. It had the smallest viewable area (15.4 inches) of the group, but it can deliver 1,600-by-1,200 resolution at 66 Hz or 1,280-by-1,024 at 76 Hz. Instead of on-screen controls, the Ergoview sports an LCD panel that tells you which of the many user-adjustable attributes you are changing. Beware: You have to press the save button within 30 seconds, or you will lose your changes.

Except for a small uniformity problem, the color quality of this display was very good. The image was sharp in the center of the screen, but grew more fuzzy toward the edges. There was slight but acceptable pincushioning. All in all, the Ergoview is not a bad monitor.—*BF*

Sigma Ergoview 170. List price: \$999. Sigma, Fremont, CA; 800-437-4624, 510-624-4900. Circle 474 on reader service card.

Smile International Inc.

Smile CB1716SL

Smile International's CB1716SL (\$699 list) is a good SOHO and business monitor that strikes a nice balance between performance and price. It placed solidly in the middle of the pack.

Based on a 0.28-mm-dot-pitch shadow mask tube, the Smile unit delivers 1,024-by-768 resolution at an acceptable 76-Hz refresh rate. It features easy-to-use, VCR-like on-screen controls for all the adjustments a typical user needs to make.

Most of its objective test scores fell in the average range, but the unit's scores were among the best here on our Average MTF and Misconvergence measures; this helped it deliver crisp text in subjective viewing. It fell in the bottom tier on the Vertical Pincushioning test, though no error was noticeable in subjective testing. Horizontal-line resolution was good but not excellent, and the colors and images looked bright and rich. The Smile is a good choice for general business use.—*BB*

Smile CB1716SL. List price: \$699. Smile International Inc., Costa Mesa, CA; 800-876-4532, 714-756-0336. Circle 475 on reader service card.

Sony Electronics Inc.

Sony Multiscan 17sf II, Sony Multiscan 17se II



Professional graphics users will warm to the \$1,099 Sony Multiscan 17se II (\$1,000 street), which was one of the top monitors we evaluated. Mainstream business users should consider the lower-priced Sony Multiscan 17sf II (\$879 list, \$800 street)—the top finisher on our overall MonMark ranking.

The two Multiscan monitors use the same basic Trinitron tube with a 0.25-mm aperture grille. Both offer digital controls and on-screen displays. The major difference between the two is that while the top resolution of the Multiscan 17sf II is limited to 1,280-by-1,024 at 60 Hz (opt for 1,024-by-768 mode at a flicker-free 80 Hz), the Multiscan 17se II is able to produce a 1,600-by-1,200 image with a 60 Hz vertical refresh rate and a 1,280-by-1,024 display with a more ergonomic refresh rate of 78 Hz. In addition to a standard VGA connector, the 17se II also includes a BNC plug for high-end graphics adapters.

Subjectively, both Multiscans revealed some vertical pincushioning that couldn't be completely resolved using the image controls, though their scores still fell within the acceptable range on our objective test; both managed to do better on our horizontal pincushioning tests. The 17sf II scored in the excellent range on our Misconvergence and Average MTF tests, showing fine focus and image clarity. The 17se II was a top finisher on the Average



Samsung SyncMaster 17GLI, Sony Multiscan 17se II, Sony Multiscan 17sf II.

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matrox

Matrox Graphics Inc. 1025 St. Regis Blvd. Dorval, Quebec, Canada, H9P 2T4 Tel: 514-969-6320 Fax: 514-969-6363 In Quebec, call: 514-969-6330
All performance tests conducted by Matrox Graphics Inc. on a Gateway P5-166 configured with Intel P5-166MHz, 16MB of EDO RAM with 256K cache. The Matrox Millennium and Diamond Stealth 64 Video 3240 XL were configured with 2 MB of memory, and the Number Nine Imagine 128-2 was configured with 4 MB of memory. for the PCI bus using driver releases 3.11, 4.02.268 and 2.09 respectively. Matrox Mystique Diamond Stealth 3D 2000XL and ATI 3D XPRESSION were configured with 2 MB of memory for the PCI bus using driver releases 3.11, 1.0 and 2.22 respectively for Windows 95. WinBench 95 tests conducted at 1024 x 768 resolution with 8-bit color at 75Hz refresh using large fonts under Windows 95.

CIRCLE 381 ON READER SERVICE CARD

17-Inch Monitors

MTF measure, though subjectively we noticed some focusing shortcomings on our Misconvergence tests. We think you will be pleased with either, however.—*JRQ*
Sony Multiscan 17sf II. List price: \$879. **Sony Multiscan 17se II.** List price: \$1,099. Sony Electronics Inc., San Jose, CA; 800-352-7669; www.sel.sony.com/sel/ccpg. Circle 476 on reader service card.

techmedia Computer Systems Corp.

techmedia TCM-1700G

The techmedia TCM-1700G doesn't offer a snazzy cabinet or fancy controls. With a list price of \$699 (\$650 street), it's aimed at the small-business and home markets. It delivers slightly above-average performance for its price class.

The TCM-1700G uses a conventional flat-square CRT with a 0.28-mm dot pitch. It delivers 1,024-by-768 resolution with a 75-Hz vertical refresh rate. In subjective evaluation, techmedia's entry was not particularly sharp, with some detectable focus shortcomings. Still, it displayed tough graphic images with aplomb. The TCM-1700G ranked just slightly above average on our objective tests. The only real drawback was a rather low Luminance score; images appeared slightly dim. Those needing a larger display for nondemanding chores should look at the TCM-1700G.—*JRQ*
techmedia TCM-1700G. List price: \$699. techmedia Computer Systems Corp., Garden Grove, CA; 800-379-0077, 714-379-6677; www.techmedia.net. Circle 477 on reader service card.

ViewSonic Corp.

**ViewSonic 17EA,
ViewSonic PT770**

ViewSonic Corp.'s PT770 (\$895 list, \$845 street) and 17EA (\$699 list, \$645 street) are both good deals. The PT770 is intended for the high-end user of desktop publishing and high-quality graphics applications. The speaker-equipped 17EA is aimed at the business user for multimedia applications.

Both ViewSonic monitors include color-matching capabilities with individual color adjustment, and both use on-screen controls for user adjustments. The ViewSonic PT770 is based on a 0.25-mm aperture grille tube and uses ViewSonic's



vertically flat SonicTron screen. It was among the top ten units we tested on objective tests for MTF and color tracking; the rest of its test scores were in the average range. On subjective tests, the PT770 was an excellent performer, with bright colors and excellent geometric control.

The 17EA has a 0.28-mm-dot-pitch shadow mask tube and built-in speakers that produce clear sound but not much volume. It was among the top monitors on objective tests of RMS misconvergence, color uniformity, and luminance; it ranked seventh on our MonMark scale. On subjective tests, luminance uniformity appeared to be off a bit, with slightly darker images on the left side of the screen.

Both monitors are recommended, the 17EA for average applications and the more expensive but better-performing PT770 for more demanding users.—*BB*
ViewSonic 17EA. List price: \$645. **ViewSonic PT770.** List price: \$850. ViewSonic Corp., Walnut, CA; 800-888-8583; www.viewsonic.com. Circle 479 on reader service card.

WYSE Technology Inc.

WYSEvision WY-17PS

The WYSEvision WY-17PS (\$995 list, \$920 street) was designed for the high-end graphics-intensive market, and the quality and performance of this display make it worth the higher price.

The WY-17PS is WYSE's first monitor to use a DiamondTron tube. It has a 0.25-mm aperture grille tube, a display of 1,600-by-1,200 at 60 Hz, and the largest viewable screen area in this roundup (16.2 inches diagonally). There are more controls than on most high-end units, including purity, sub-H phase, and auto-picture (automatic sizing). The generous three-year warranty

covers parts, labor, and the CRT.

This monitor had one of the sharpest pictures we saw and also provided excellent color quality. Its performance was above average on almost every objective test, placing in the top tier on our MonMark rankings. Subjectively, there was a small but visible problem with pincushioning balance on the vertical lines. This was one of the best monitors we tested.—*BF*
WYSEvision WY-17PS. List price: \$995. WYSE Technology Inc., San Jose, CA; 800-438-9973; www.wyse.com. Circle 480 on reader service card.

Zenith Data Systems

Z-Vision ZCM-1750-UT

Zenith Data Systems' Z-Vision ZCM-1750-UT monitor (\$795 list, \$800 street) is targeted at mainstream corporate desktops. But the Z-Vision's mixed performance on both objective and subjective tests makes it a debatable buy.

The Z-Vision has a 0.26-mm-dot-pitch shadow mask tube. A series of buttons for screen controls is easy to decipher. While the Z-Vision scored among the top ten on our Horizontal Pincushioning and Luminance tests, those scores were counterbalanced by low scores on the Misconvergence, Vertical Pincushioning, and Uniformity tests—though all results were still in the acceptable range. In subjective evaluation, the unit had good geometric control. Colors were generally good but a little less bright and crisp than on most monitors. This is a moderate-performing but unexceptional monitor.—*BB* □

Z-Vision ZCM-1750-UT. List price: \$829. Zenith Data Systems, Buffalo Grove, IL; 800-533-0331; www.zds.com. Circle 481 on reader service card.

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PC Tech

THE DEFINITIVE GUIDE TO PC TECHNOLOGIES & TOOLS

Inside the Netscape Navigator Platform

The Navigator platform is *the* Web client. We look at what it offers and how it's changing.

By Richard V. Dragan and Thomas Mace

End users think of Netscape Navigator as a browser. Web developers see it as a development platform—that is, as *the* Web client development platform, given Navigator's status as the overwhelming market leader. Apart from Navigator's ability to render HTML and various multimedia types, the core features of this platform are Navigator's plug-ins and plug-in support, its Java virtual machine (VM) for running Java applets, a runtime environment for executing JavaScript code, and Navigator Objects, a set of programmatic objects in the browser accessible to JavaScript code. Two additional key pieces are the Plug-In SDK for developing plug-ins and the JavaScript scripting language itself. The 3.0 beta release of Netscape Navigator brings several important enhancements to the platform, especially LiveConnect,



HOT GRAPHICS: Get quick palettes. *page 317*

IN THIS SECTION



TUTOR Windows 95 shortcuts, probably one of the operating system's most popular features, allow you to access your most frequently used programs quickly. Jeff Prorise explains some less obvious uses for shortcuts and provides a utility that remedies a minor inefficiency inherent in using shortcuts. *page 293*



POWER PROGRAMMING

Seven ways to supercharge your 32-bit graphics code: Find out how to take advantage of the Win32 API's rich assortment of graphical functions to accomplish such tasks as producing color palettes quickly, dithering bitmaps, drawing bitmaps with transparent pixels, creating device-independent bitmap sections, and generating graphical program buttons easily. *page 317*



UTILITIES MonSys is an enhancement for the Windows 95 System Monitor accessory. It lets you place different categories of system performance

on separate tabbed pages, with the most active system statistics appearing at the top of each page. MonSys places its icon in the system tray on the right-hand side of the Taskbar. *page 345*

ALSO IN THIS ISSUE In PC Solutions, we tell you how to make sure your desktop shortcuts in Windows 95 are always accessible, give you some good reasons why you shouldn't use tape as a disk drive, discuss the possibility of dual-booting Windows 95 and Windows NT, explain why you should avoid naming a file CON.DOC, present an easy way to load data into combo and list boxes in Microsoft Access, and more. *page 367*



Plugging in: The LiveConnect/Plug-In SDK 3.0

By Richard V. Dragan

With Version 3.0 of its Plug-In SDK, Netscape has added significant new support for Java and JavaScript to its traditional browser plug-in component model. You can still program the old way and treat Navigator plug-ins simply as DLLs that support a few basic functions that let them cooperate with the Netscape browser. Or you can take advantage of the new Java support, which lets plug-ins use Java classes themselves or be called by other Java objects. What's clear from the latest release of the plug-in developers' tools—now called the Netscape LiveConnect/Plug-In SDK 3.0—is that these extensions give new life to the plug-in model and uphold plug-ins as a competitive alternative to Microsoft's emerging ActiveX technology.

The advantage of Netscape's plug-in approach has always been its simplicity at bringing existing C/C++ code to Internet browsers. From the beginning, the Netscape Plug-In SDK has always been a small set of Netscape Navigator C APIs (in a single header file), which, when used with your program, makes your program a citizen of the Netscape browser. For those who are interested, the newest version of the SDK includes half a dozen sample C++ classes to encapsulate the C API. In a world of gigantic API sets, however, the Netscape Navigator API is unique in that it is still simple enough to work within plain old C. Relatively speaking, your code has few responsibilities and does not usually have to be rewritten from scratch to fit within the plug-in model.

The Netscape API that turns your C/C++ program into a plug-in is contained in the `<npapi.h>` header file. Note that in Navigator plug-in programming, you use your C/C++ compiler of choice—which is, of course, platform-specific. Fortunately, Netscape has taken care to ensure this API performs nearly identically across a number of different platforms, including 32-bit Windows, Macintosh, and Unix.

INSIDE THE PLUG-IN API

Two distinct sets of API calls are involved. The first set consists of system events that need to be supported by every plug-in. These are functions that Netscape browsers call for such system events as initialization, creation of a new instance of a plug-in, stream and print, and clean-up. These Netscape functions are prototyped using an "NPP_" prefix, as in `NPP_Initialize()`, for loading your plug-

in, or `NPP_Shutdown()`, for clean-up. There are just over a dozen of these required events. Since a plug-in depends on its browser for its context—an approach called sandboxing—the plug-in must cooperate by responding to browser events. A good example of this is the `NPP_SetWindow()` API call, which tells your browser in which window it should run. Change your browser's window size, and this event gets sent to a plug-in to tell it where it's running.

The second set of plug-in APIs includes another dozen or so functions that are already implemented in the browser. Your plug-in can call as many of these as it needs to. Memory allocation and clean-up provide two examples. When a plug-in needs some memory, it calls `NPN_MemAlloc()`. In order to free up a block of memory, it would call `NPN_MemFree()`. To control access to network resources, there are other `NPN_` functions that do the actual work on the Web, such as `NPN_GetURL()` or `NPN_GetURLNotify()`, or `NPN_Write()` to write to a network stream. Other functions let a program access Java components, such as `NPN_GetJavaEnv()` for the browser's Java implementation, or `NPN_GetJavaPeer()` to access the Java object associated with another plug-in (more on this below).

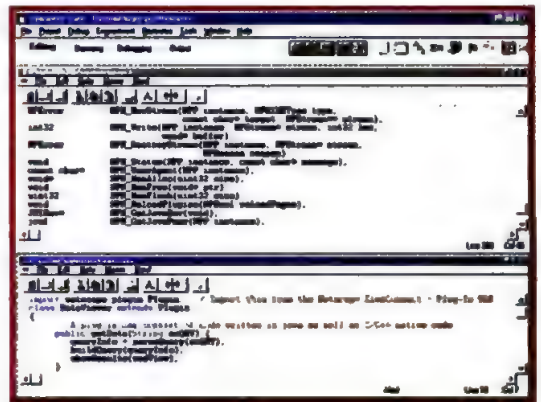
The Netscape Navigator Plug-In API is remarkably simple and, by any measure, a huge success. Today, over 80 plug-ins are downloadable from Netscape's Web site, and more are being added all the time. Certain multimedia plug-ins for audio and video, such as Progressive Networks' RealAudio and Macromedia's Shockwave, have achieved the status of Internet classics.

Considering that most plug-ins are designed to let you view a particular type of document, it's worth our time to take a quick look at how the relatively simple process of inserting these documents into an HTML file works.

Every plug-in gets its own MIME type, which is referenced inside the HTML document. To insert a document that uses a plug-in, you use the `<EMBED>` tag, where "type" specifies the MIME type of your plug-in. You can also pass other parameters to the plug-in, including height, width, and a URL.

Like ActiveX controls, Navigator plug-

ins must be downloaded to the user's workstation. Through a feature called assisted installation, the Netscape browser will check your `/PLUGIN` directory (on a Windows system) for a specific plug-in type, and if it's missing, prompt you to download that plug-in from a specified URL. The plug-in downloads and then registers the new MIME type. This isn't an ideal process, however; usually, the user must load a different URL



The Navigator Plug-In API includes a set of functions that let your plug-in access memory and even Java objects.

to get the plug-in, which means leaving the original site. In the current version of Netscape Navigator, you must also restart the browser in order to use the new plug-in. (With JavaScript, more elegant installation routines are becoming possible, including on-the-fly version-checking.)

On the other hand, an ActiveX control is responsible for installing its own type library inside your system's Registry. For Navigator plug-ins, installation is a less-invasive procedure and can even be done by the user, by copying a DLL to the `/PLUGIN` directory and manually registering a new MIME type in the Netscape browser.

You might think that all Navigator plug-ins are really viewers to manage new types of content. This is largely true, but there are also proprietary applications that plug-in developers have brought to the Internet with a minimum of fuss, simply by adding support for Netscape APIs. If you were in a hurry to get an application for Windows (or any other OS) into a browser, doing it via a plug-in is probably the quickest way.

EXTENDING YOUR REACH

Up until now, questions about using the plug-in approach always centered on its long-term viability. These concerns are allayed by the latest release of the Netscape

The Netscape Navigator Platform

Plug-In API, which supports Java and JavaScript, and by the introduction of Netscape's LiveConnect.

LiveConnect lets plug-ins talk to Navigator's Java Runtime Interface (JRI). By being able to access Java, plug-ins now get all sorts of new powers. Not only can Navigator plug-ins call Java objects—both standard and custom Java classes—but they can also expose their methods to Java and behave like Java objects. Microsoft has taken the same tack with ActiveX controls, making them accessible to Java code. This strategy means that a true “conversation” can take place—although its specifics may vary a bit, depending on who's doing the talking.

How could a plug-in get at an existing Java class? The answer is by calling one of those Netscape APIs—in this case, `NPN_GetJavaEnv()`, which returns a reference to the JRI. With this pointer in hand, you can call Java objects, but what do you actually call? Well, you can generate header files based on existing Java classes using the `javah.exe` tool shipped with the LiveConnect SDK. (Similarly, Microsoft Visual J++ provides tools to generate Java classes based on ActiveX type libraries.) The `javah.exe` tool generates C functions or C++ header files based, according to specific conventions, on Java classes. Java data types are mapped to certain C/C++ data types. For instance, the Java boolean type maps to the (typedef'd) `jbool` C++ type, while a Java `int` type maps to `jint` in C/C++. Class names from Java get written into the C++ version along with the Java package to which they belong. (For example, a Java Integer class object would be accessed using a pointer named `java_lang_Integer`.) Data members in Java are accessed using, for example, `set_` and `get_` methods. To access a Java member named `count`, the `javah.exe` utility would create a `get_count()` and `set_count()` method in C++.

Overloaded Java classes present a special problem in this model. The solution here is that when the same method is called using varying numbers or types of arguments in Java, the `javah.exe` tool uses the original method name for the first set of arguments and adds an index to subsequent overloaded functions. For example, for a method overloaded three times, the method names would be `myMethod()`, `myMethod_1()`, and `myMethod_2()`. This means that the default—and the most common—way of calling a Java method should ideally be declared first. Of course, you have no control over this when using a Java object from one of the standard packages.

Once you have created header files that tell your compiler about available Java objects and methods, you can call them from your plug-in. The syntax here is a little different, owing to the fact that your first parameter is always a pointer to the Java environment. In Java, you say `int Len = myString.length()`, and in a C++ plug-in you would say `jint Len = str->length(env)`. Obviously, the syntax here is more difficult than working in Java itself, and ideally, you would try to keep the exchange here to a minimum.

EXPORTING PLUG-IN FUNCTIONALITY

Exporting the functionality of a plug-in to Java means managing a few more details, but the basic principle is simple enough: The LiveConnect/Plug-In SDK 3.0 includes a special Java class named *Plugin* that takes care of attaching other Java classes to your plug-in. You declare all the methods exported by your plug-in in a Java class that extends the class *Plugin*. You then use the `javah.exe` tool to generate “stubs” so that Java can now hook into your plug-in code. There are other conventions to worry about here, but overall, they are a lot less hefty than, say, programming with OLE automation in C++. It will take some experimentation to get your plug-in code to work as a Java object, but it's a manageable task with a significant payoff. Fortunately, solid online help, in the form of HTML pages, is available within the SDK.

Once both types of conversations—plug-in to Java and Java to plug-in—are set up, they provide new possibilities for both programmers and content designers. For programmers, Java-enabled plug-ins can call other plug-ins or Java objects. These components can now work together. (In earlier versions, each plug-in worked independently within the browser.) As with ActiveX technology, where Microsoft has modified its Java virtual machine to work with Microsoft's proprietary technology, the implementation of Java in the Netscape browser has to know about plug-ins in order to support interoperability between plug-ins.

For Web designers, a Java-powered plug-in can now be manipulated using JavaScript, adding another link in the conversation chain. JavaScript communicates with Java, which in turn talks to your plug-in. Once a plug-in is made available to other Java components, its capabilities are greatly expanded. Clearly, by opening up the traditional plug-in to both Java and JavaScript, Netscape is offering developers a migration path to Java. In the meantime, if you are in hurry to bring legacy C/C++ code to your browser, you should seriously consider the Netscape LiveConnect/Plug-In SDK.

a set of new services that provides a bridge between plug-ins, Java, and JavaScript. In this story—the first of a three-part series that focuses on Microsoft and Netscape's Web platforms and on Java VMs—we'll look at the major Navigator components from the developer's perspective and how they've changed in the new release. Two of the most important pieces, plug-ins and the Plug-In SDK, are covered in the sidebar within this article, “Plugging in: The LiveConnect/Plug-In SDK 3.0.” Java programming and the Java VM are huge subjects unto themselves, but we'll look at how LiveConnect allows interaction between Java and other platform elements.

JAVASCRIPT

Despite its name, JavaScript has only a remote kinship with the Java language. JavaScript was developed by Netscape as a server-side scripting language and originally released under the name LiveScript. When Netscape moved to Java as its core language for client/server interaction, it repurposed LiveScript as a scripting language for the Navigator browser and relaunched it as JavaScript.

JavaScript's syntax will look familiar to C programmers in many ways, from the curly brackets and the ++ increment operator to the distinction between the = assignment operator and the == equal-to operator. Compared with Microsoft's Visual Basic Scripting Edition (VBScript), JavaScript is extremely rich in C-like unary, binary, Boolean, and bitwise operators. But its flow-control statement syntax, though fully adequate, is less rich. We were surprised by the omission of a Switch statement or equivalent, for example.

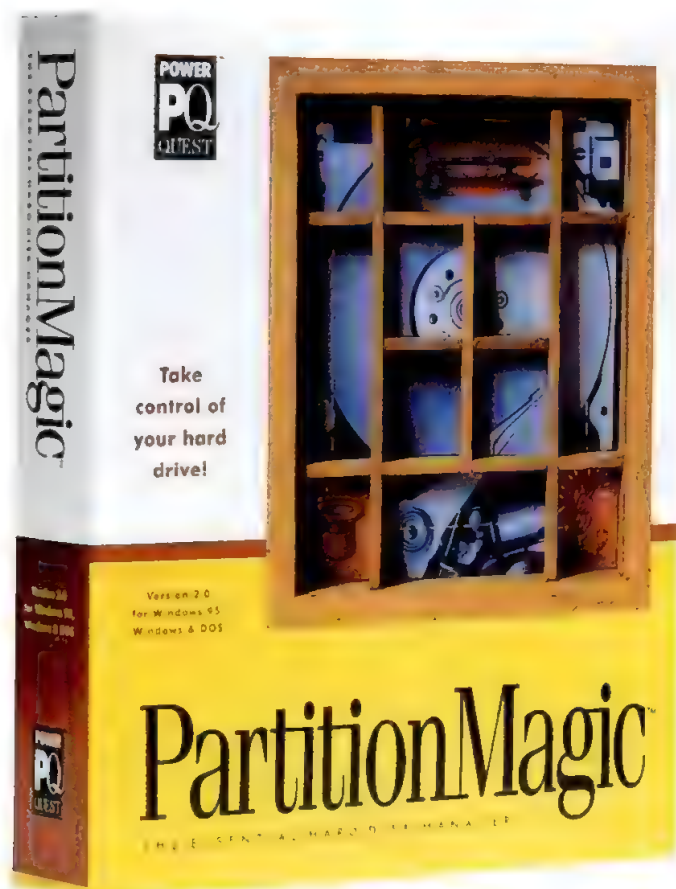
Like Microsoft's VBScript but unlike Java, JavaScript is implicitly rather than strictly typed. You don't predeclare variables but simply create them on the fly with an assignment statement. The runtime script engine automatically allocates memory for variable storage and performs any type conversions that may be necessary (a number to a string, for example). If the conversion is inherently impossible (you can't meaningfully convert a string of letters to a number), the environment generates an error. If you are combining your own code with an external script file downloaded via the SRC attribute (a new feature in the 3.0 beta release), you could easily encounter conflicts between variable names. Using the *Var* keyword as a prefix for variable declarations will automatically keep conflicting local variables out of each other's way.

Another important distinction between JavaScript and Java: JavaScript is not a true object-oriented language in that it doesn't let you create classes or build inheritance hierarchies. But, like almost all modern scripting languages, JavaScript is object-based in that it provides a number of built-in objects whose properties and methods you can access in any

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The Netscape Navigator Platform

of the JavaScript environments. It also uses the familiar object-dot-property notation to reference them.

Some objects, like the string object, are created on the fly when you create a string, yet still give you access to properties (like length) and a host of useful methods for parsing strings or writing formatted HTML text to the screen. Others, such as the Math object (which provides a large variety of math functions and constants), do not need to be instantiated but can be referenced directly in your

external function that does the work and assigning that function's name as a member function within the constructor, as in

```
this.method = myFunction
```

You create instances of the object using the new keyword, as in

```
mybar = new foobar (arguments)
```

This statement creates an object *mybar* as type *foobar*. In the 2.0 release of Netscape Navigator, arrays were not part of the language; instead, they were constructed and created in this manner, through a special object called *makeArray*. (Release 3.0 adds arrays as an intrinsic language object.) Although JavaScript's approach to objects is far from rigorous, it does get the job done and, arguably, encourages object-aware thinking.

JAVASCRIPT ON THE PAGE

Your JavaScript source code is sent to the browser as text. Normally, it is embedded directly into the HTML page, using the `<SCRIPT>` tag with the attribute `LANGUAGE="JavaScript."` The 3.0 release of JavaScript also supports the downloading and execution of separate script files through the `SRC="filename.js"` attribute of the `<SCRIPT>` tag. This tag tells the browser to download and execute the external script file named in the tag (whose extension is always .js). This offers the advantage of letting you maintain your HTML and script files separately.

Scripts are normally placed in the `<HEAD>` section of the page so that they are evaluated before any HTML objects that might interact with the script are created. Scripts that generate HTML elements may have to be placed in the `<BODY>` section. Script is placed inside `<!-- -->` comment tags to hide it from JavaScript-unaware browsers. You can add comments within your code using ANSI-C (`/**/`) or C++ (`//`) symbols.

Surprisingly, Netscape does not offer even rudimentary tools for developing scripts. Any text editor can do the job of script creation,

but when it comes to debugging, you're on your own. This is unfortunate, given the relative complexity of the language. Having to rely on runtime error messages and document.write statements (a JavaScript analog for C's venerable printf statement) feels like a giant step backwards.

NETSCAPE NAVIGATOR OBJECTS

In addition to providing the JavaScript runtime engine, Netscape Navigator exposes a variety of objects that can serve as the bases for complex event-driven applications containing standard GUI elements. Many of these objects (in particular, the forms object, with its text box and button elements) are derived from HTML elements on the page. The fact that these objects are exposed programmatically means you can set their properties, handle their events, and use their methods through script. The ability to control Navigator Objects is where the real power of JavaScript comes through.

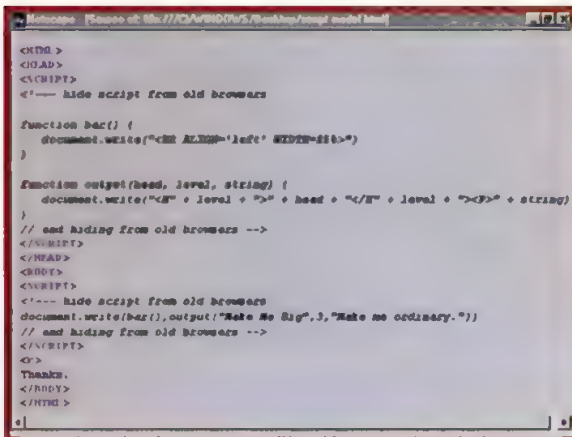
Navigator defines a hierarchy for these objects. At the highest level are the Window, Location, History, and Document objects. Of these, the Document object is the richest and most important. It is the parent object for all the form, link, and anchor objects in the page, and its `write` method can be used to generate HTML directly to the page. The Document object's `onLoad` and `onUnload` events also let you fire code when the user enters or exits the page.

For each form in the Document object, Navigator creates a form object, which is referenced as

```
document.form
```

Each form object encapsulates all of the HTML elements that comprise the form. The elements that you can create or manipulate include the usual collection of buttons, check boxes, radio buttons, text boxes, text areas, and reset, select, and submit buttons.

The Document object's link and anchor objects are arrays that hold, respectively, all anchor and links in the document. The document object also provides a cookie property that lets you access or alter the document's entry in Navigator's cookies.txt file. This file can hold persistent information that, for example, lets your script check whether or not



JavaScript code can be included directly in HTML documents with the `<SCRIPT>` tag.

code. Finally, there are a number of useful string-to-number conversion functions that are not associated with any object whatsoever. (To ensure that JavaScript programs cannot perform malicious behavior, the language does not provide any general disk I/O or memory-access objects or functions.) The emphasis here is less on setting up a rigorous object model and more on providing easily accessible functionality.

Functions serve as the basic vehicle for organizing your JavaScript code; you create and call them much as you would in any structured language. The syntax is familiar, with the function name followed by arguments in parentheses and the function body delineated by curly brackets.

USER-CREATED OBJECTS

JavaScript also uses functions as the foundation for user-created objects. You create an object through a *constructor* function, which is essentially a function definition whose name is the name of the object you wish to create. You add properties to the object by assigning the function's arguments to member properties within the constructor. The keyword *this*, which always refers to the current object, is useful in these assignment statements, as in

```
this.property1 = argument1
```

Similarly, you add methods by creating an

FOR JAVASCRIPT AND PLUG-IN DEVELOPERS: URLs AT A GLANCE

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The Netscape Navigator Platform

the user has accessed a particular page within a given time period and make any desired modifications to the page accordingly.

LIVECONNECT

From the developer's perspective, the most important new feature in Navigator 3.0 is LiveConnect, a set of browser services that lets JavaScript call Java Methods and control Java applets and plug-ins. You can also access the properties and methods of JavaScript objects through Java and use Java class constructors in JavaScript. One of the most common uses of the technology will be to control applets. Applets are referenced in code through the Document object, and you have access to all static methods and properties and all public variables. You'll need access to the applet source code or at least knowledge of its method and variable names. (For details on using LiveConnect, see the sidebar "Plugging in: The LiveConnect/Plug-In SDK 3.0.")

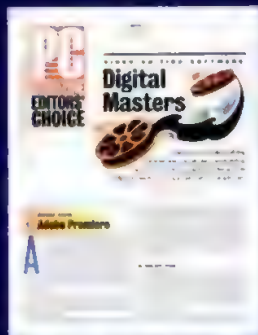
SUMMING UP

The Netscape Navigator platform, with its plug-in architecture, Java VM, JavaScript language, and exposed programmatic objects, represents a de facto definition of the Web client. Although Java is clearly the core of Navigator's long-term strategy, the Netscape Navigator Plug-In API has been remarkably successful and is adapting to the times. Today, LiveConnect allows developers to mix these technologies as they move forward. The fact that the only other significant browser on the market, Microsoft Internet Explorer 3.0, has adopted all of these Netscape technologies merely cements Navigator's position as the standard development platform for Web clients.

The only serious question about the Navigator platform concerns Microsoft's ActiveX control standard, which Netscape has said it has no plans to support. (ActiveX support can be added to Navigator through the NCompass plug-in from NCompass Labs.) ActiveX controls are in some ways easier to work with programmatically than are Java applets. Also, existing Java libraries still can't match the rich selection of ActiveX controls available today. Microsoft is pursuing a Java/ActiveX/VBScript/JavaScript integration strategy that parallels Netscape's LiveConnect. Given the importance of the ActiveX standard among developers and its wide support from third-party tools, we ultimately expect to see Netscape add ActiveX support to Navigator. The resulting platform, derived from standards set by both Microsoft and Netscape, will be an even richer one for developers. □

Netscape Navigator 3.0 beta. List price: Available free for downloading. Netscape Communications Corp., Mountain View, CA; 800-638-7483; home.netscape.com. Circle 499 on reader service card.

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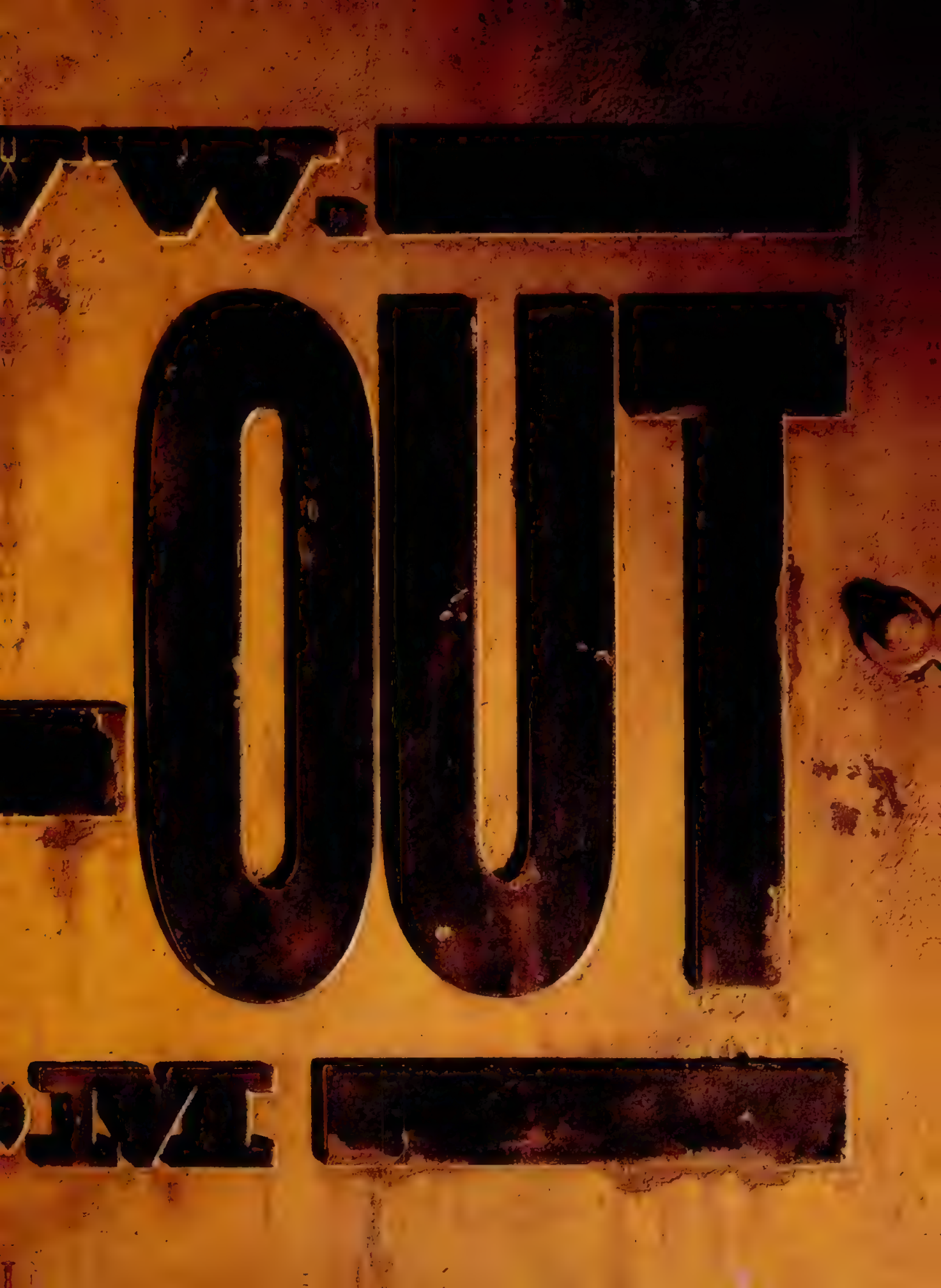
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By Jeff Prorise

Take the Shortcut

Windows 95's shortcuts get you there faster, but there's a small price.

One of the unsung heroes of the Windows user interface is the .LNK file, better known as the "shortcut." Almost everyone who has worked with Windows 95 knows that a shortcut is a file that points to a file, folder, printer, program, or other kind of object. In most respects, a shortcut behaves just like the object to which it points. Double-clicking a shortcut to an .EXE file, for example, executes the program. Double-clicking a shortcut to a document file opens the document for editing.

The beauty of shortcuts is that they're so small, you can scatter them all over your hard disk—on the desktop, in file-system folders, and in the Start menu, for example—to provide easy access to the tools you use most often. Windows 95 itself uses shortcuts to represent items in the Documents and Programs menus, among other things. So many clever uses for shortcuts exist, even advanced users often fail to use them to their full potential.

One of my reasons for writing this column is to share with you some of the more creative applications I've seen for shortcuts. Another is to provide new users with a basic education in what shortcuts are and how they work.

But I would also like to share one of my pet peeves about shortcuts—one that can rob you of modest amounts of disk space without your even knowing about it. No, I'm not talking about the fact that storing a 300-byte .LNK file takes a full cluster of disk space (although that's something to keep in mind, too). What I'm referring to is much more subtle than that, but something that's easily fixed with a free utility program you can download from PC Magazine Online.

SHORTCUT BASICS

As you already know, a shortcut is an object that points to another object. The object to which a shortcut points can be a file-system object, such as a file or folder, or it can be a non-file-system object, such as a printer. It doesn't matter which, because all such objects are part of what we refer to as the shell's *namespace*. A shortcut can point to

virtually any object in the shell's namespace.

Windows 95 supports numerous methods of creating shortcuts. One way to create a shortcut is to hold down the Ctrl and Shift keys while dragging the object you wish to create a shortcut to (the "target" of the shortcut) out of its folder and dropping it into the desired folder. Another way to create a shortcut is to drag an object with the right mouse button and select "Create Shortcut(s) Here" from the context menu that pops up when you release the mouse button. A third method is to right-click a folder (or the desktop, which is just a special type of folder), select New and then Shortcut from the context menu, and follow the instructions in the "Create Shortcut" wizard. You can even create a shortcut by drag-

utilities written by Microsoft developers, includes an option for disabling the "Shortcut to" option altogether. For more information, visit the PowerToys Web page at www.microsoft.com/windows/software/powertoy.htm.

It's easy to identify a shortcut's target. Just right-click the shortcut icon, select Properties, and click the Shortcut tab in the property sheet. You'll see the target's name in the Target box. For a quick way to open a window to the folder that contains the target, click the Find Target button.

A shortcut is stored on your hard disk as a file with the special filename extension .LNK. The .LNK file format is undocumented, but that's not important, because the shell provides a set of OLE functions that programs can

use to read and write .LNK files. Most of the functions belong to the OLE IShellLink interface, which is documented in the *Programmer's Guide to Microsoft Windows 95*, from Microsoft Press (1995), but the IPersistFile interface plays a role in reading and writing .LNK files, too. Thanks to these interfaces, it's not difficult to write a program that extracts information from .LNK files or creates .LNK files of its own. And none of this requires the program to have any

knowledge of the .LNK file format.

Where does the system store .LNK files representing shortcuts? In the folders where the shortcuts are created, of course. Shortcuts placed on the desktop are located in the hard disk directory that corresponds to the desktop folder. On many PCs, that directory is C:\Windows\Desktop, although it could be something like C:\Win95\Desktop or C:\Win95\Profiles\Bill\Desktop, depending on which directory you installed Windows 95 in and whether user profiles are enabled. Use the Find command in the Start menu to scan your hard disk for .LNK files, and you may be surprised at how many there are. My hard disk contains no fewer than 139 of them. Most are stored in the hierarchy of subdirectories that defines the contents of the Start menu; the same will probably be true of your hard disk.

Windows 95 works a lot of magic behind the scenes to make shortcuts work. The clue

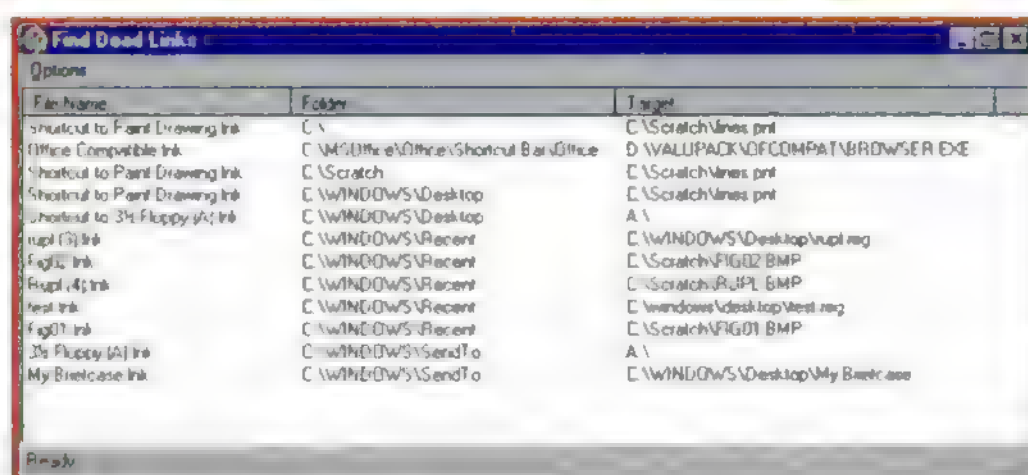


FIGURE 1: Fdlinks lists all the dead shortcuts on a drive and gives you the option of deleting them.

ing an object out of a folder and dropping it onto the Start button. The resultant shortcut will show up as an item in the Start menu.

Once created, a shortcut is easily identified by a small arrow in the lower-left corner of its icon. It's possible to remove the arrow, but I for one find it helpful, because it makes me less likely to delete an important file accidentally, when I really meant to delete a shortcut. (Deleting a shortcut does *not* delete the shortcut's target.) Many shortcuts have "Shortcut to" in their titles. The system adds this designation by default when it creates a shortcut for you, unless you've recently deleted "Shortcut to" from a few shortcut titles. Windows 95 has been widely praised for its ability to watch how you work, and it will stop adding "Shortcut to" if you delete it enough times, but in fact the system doesn't go far enough, because it doesn't remember your preference across sessions. The Windows 95 PowerToys, a collection of free

to much of the magic is found in the registry under HKEY_CLASSES_ROOT\lnkfile, which is the registry alias for—you guessed it—files with the extension .LNK. You'll see registry entries for several shell extensions that apply specifically to .LNK files. When you drop a file icon over a folder shortcut, for example, the system consults the registry, sees that there is a drop-handler shell extension registered for .LNK files in the system file Shell32.dll, and calls the drop handler to copy the file to the folder to which the shortcut points. Developers can add new types of behavior to .LNK files by writing shell extensions for them.

PUTTING SHORTCUTS TO WORK

So what can you do with shortcuts? Plenty. First, there are the obvious things, like fast access to often-used applications from the desktop. Even if a favorite application's .EXE file is stored deep down in the subdirectory structure, you can launch it by simply double-clicking a shortcut on the desktop.

Don't forget that shortcuts can also point to document files, folders, drives, and printers. I keep a few document shortcuts on my desktop so I can open the documents quickly, without having to open My Computer or Explorer and find the folders containing the actual document files. One of the shortcuts is to a document named "Topics for Upcoming Columns," where I jot down ideas for columns. (When an idea strikes, I want to get to that document fast!) I also have shortcuts to a few important folders sitting within easy reach on the desktop, including one for columns awaiting editing and another for "scratch" documents that need a temporary home. And because I frequently back up the documents on which I'm working to a floppy disk, I keep a shortcut to drive A: on the desktop, too. As a result, backing up a file is no more difficult than dragging its icon to the shortcut and dropping it. Some users create shortcuts for all their drives on the desktop to lend Windows 95 a Mac-like appearance.

One drawback of having your desktop loaded with shortcuts is that the desktop is often obscured by other windows. A shortcut won't save you much time if you have to minimize four or five windows to get to it. One way to get to a shortcut quickly—and I do mean quickly—is to assign it a shortcut key. To demonstrate, create a shortcut to Notepad and place it on the desktop. Then display the shortcut's property sheet, go to the Shortcut page, click once inside the box labeled "Shortcut key," and press Ctrl-Alt-F12. Click OK to finish up and then go back to working in another app. When you want to start Notepad, just press Ctrl-Alt-F12. You don't need to quit or minimize the window you're working in first. But do note that for the shortcut key to work, the shortcut itself must be located on the desktop.

Another way to make desktop shortcuts readily accessible is to create a shortcut to the desktop itself. The process is not as straightforward as it sounds, so here's how to go about it: First, open the Startup folder and right-click inside the folder window to display the context menu. Select New | Shortcut from the menu and type

```
explorer /root.
```

into the command line box. (Don't forget the comma; the shortcut won't work without it.) Click the Next button and type

```
Desktop
```

into the "Select a name" box. Then click Finish to create the shortcut. Next, go to the Shortcut page of the shortcut's property sheet and select Minimized from the list of Run options. (For a nice touch, you can click the Change Icon button and select the icon that looks like a desktop with a little lamp over it.) Finish up by clicking the property sheet's OK button. From now on, when you start Windows 95 there will be a "Desktop" button in the Taskbar. To quickly open a folder to the desktop, simply click that button.

I wish I could take credit for thinking this one up, but in truth I learned about it from Scott Finnie's new book, *The Underground Guide to Windows 95* (1996, Addison-Wesley). This book has a lot of good tips, so I suggest giving it a look if you haven't already.

Have you ever stepped away from your desk for a few moments and wished you could tell your screen saver to kick in immediately instead of waiting for the usual time-out period to elapse? It's easy to do with a shortcut. Go to the Windows folder on the drive where Windows 95 is installed and open the System folder. Switch to Details view, click the Type button to sort the files by type, and scroll downward until you find the files whose type is "Screen Saver." Pick the screen saver you want and create a shortcut for it on the desktop. When you want to start the screen saver, double-click the shortcut icon. Or better yet, assign a shortcut key to the screen saver so you can start it with a keystroke.

DEAD SHORTCUTS

Now for the bad news about shortcuts. Over time, your hard disk can become cluttered with shortcuts that no longer point to anything. I call them dead shortcuts. Maybe you've long since deleted the document to which a shortcut points, or perhaps you ran an uninstall program that neglected to delete shortcuts referencing the app that the program removed from your hard disk. I've yet to see the uninstall program that deletes shortcuts other than the ones its own setup program created. Maybe one exists somewhere, but by and large, it's up

to you to delete the shortcuts you create when they're no longer needed. .LNK files are small (typically under 500 bytes), but on an uncompressed 1.2GB drive, each .LNK file takes up 32K of hard disk space.

It's tedious to sweep a hard disk for dead shortcuts manually, because you have to visit every .LNK file in every directory and pop up one property sheet after another to identify the targets. An alternative is to double-click every shortcut to see if it works. (If Windows can't find the target of the shortcut, it attempts to "resolve" the link for you by scanning other directories for the target. If that fails and the system finds an object that closely resembles the original target, it will offer to modify the shortcut to point to the new target.) Because I'm fanatical about keeping my hard disk clean, I wrote a utility to do the sweeping for me. It's called Fdlnks.exe, short for "Find Dead Links." You can download it from the Tutor Library (Lib 3) of PC MagNet's Utilities/Tips Forum, on CompuServe. For the first 30 days, Fdlnks will be in the volume archive file V15N16.ZIP in the FREEUTIL Forum, where downloads are free. This file is also available from our Web site, www.pcmag.com.

Fdlnks is shown in Figure 1. To use it, choose Select Drive from the Options menu and select a drive letter. Fdlnks will then go away for a few moments and scour the drive for shortcuts whose targets are file-system objects that no longer exist. Once the scan is complete, you can optionally delete any or all of the dead .LNK files that Fdlnks found, by using the Delete Selected Links or the Delete All Links command in the Options menu.

For safety, Fdlnks stays out of directories marked with hidden and system attributes. Among other things, this allows Fdlnks to ignore shortcuts in the Recycle Bin. Also be aware that on most systems, Fdlnks will report the shortcuts to floppy disk drives stored in the system's Send To folder as dead shortcuts if the drives are empty. Don't delete those shortcuts unless you want floppy disk drives removed from the Send To menu. In fact, you probably shouldn't delete any of the shortcuts in the Send To menu, dead or not. I considered having Fdlnks ignore targets on removable drives, but decided not to, since there are times when it's useful to know about shortcuts to places other than your hard disk.

Fdlnks doesn't delete anything unless you tell it to, so it's perfectly safe to run just to see how many dead shortcuts it can find. When you choose one of the Delete commands from the Options menu, you get a chance to say yes or no before the files are actually deleted. And when it does delete a shortcut, Fdlnks copies the shortcut to the Recycle Bin, from which it can be easily recovered. □

Jeff Proise is a contributing editor of PC Magazine.



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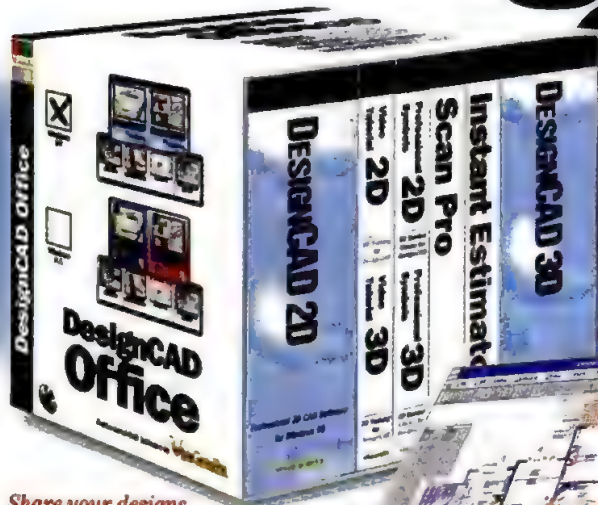


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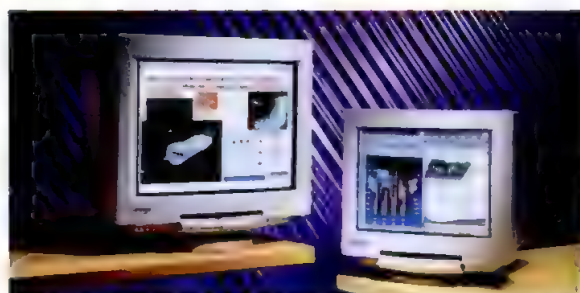


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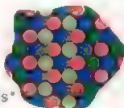
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(20.0" Viewable Image Size)

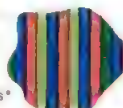
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Or find an exact number of listings, like, "give me the 200 nearest auto body shops."

3 Canvas the neighborhood.

The Select Phone Neighbor feature lets you use referrals to your best advantage. First find one of your current customers in Select Phone,



Verny Musum is Senior VP for John Paul Mitchell Systems. He searches Select Phone by business heading and ZIP code to find beauty salons in his line of hair care products. A few clicks later he's got his territory carved up for his sales force. Says Verny, "We use Select Phone and Select Street Atlas to identify new accounts and route our salespeople. It's simply amazing."

1 Do your own lookups. With ten ways to search through Select Phone – by name, address, city, state, ZIP code, phone number, business heading, distance, county, and MSA – you'll do all your lookups from your desktop, avoiding directory assistance charges.

2 Search for new business by distance. Select Phone's exclusive GeoTarget™ feature lets you search by a measured geographic range, like "all hair salons within a 15-mile radius."

then click on the Neighbor button. You'll get all the listings surrounding your best customer – on the same street, even in the same office building.

4 Zero in on potential customers.

Select Phone lets you combine search features. You can search by both

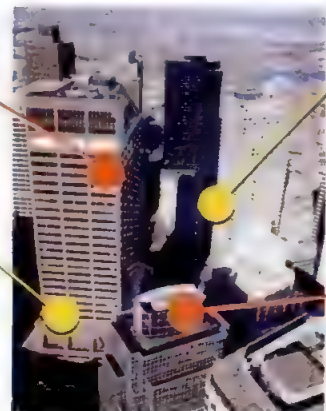
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Are you a salesperson with a new territory? A small business owner looking to cut your mailing costs? Maybe your house list needs an overhaul. Don't fret. Meet Select Phone, the desktop marketer's dream tool. It's got every published listing in the U.S. on 6 CD-ROMs. With a turbo-charged search engine that finds them with a click. Serious about finding new business? So is Select Phone.

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One click on the neighbor button and up pops this business.

Here's one of your current customers.



Type in the street address and find all the businesses in this building

Find and print out mailing labels for the 17 companies in here

boost your profits.

Find leads right on your computer – by name, business heading and more.

Business Heading (SIC code) and GeoTarget to pinpoint any specific business found within any distance from your home or office.



Brenda Jackunas is a franchise owner of Select Phone, an Oriental

Brenda uses Select Phone to identify the names and addresses of her customers' neighbors. She gets her customers' permission to have these neighbors drop by and see her work. Talk about micro marketing! Who better to sell for you than your own best customers!

5 See exactly where your customers are clustered. Select Phone's MapView™ is a quick and easy way to plot your customers, find the locations of your nearest dealers – or see where your competitors are concentrated.

6 Speed up your mailings. Select Phone can help make sure your mailings are delivered as swiftly as possible. Limit your search to only listings with ZIP+4, to make it easier for the Post

Office's automated sorting equipment to speed your mail through the system.

7 Fill-in missing info on your house list. When your store is busy, just jot down the customer's name and phone number on the sales slip. Later, simply type the phone number into Select Phone and search in reverse for the name, address, and ZIP code.

8 Keep your customer profiles up-to-date. Use Select Phone to fill in the blanks in your house list. Add ZIP+4, SIC codes,

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current phone numbers, and recent address changes.

want. Build traffic. Generate leads. Make sales soar. Then do it again.

9 Grow your database. Type in the address of a current customer and click the Neighbor button. These new prospects will multiply your list and match its demographic profile fast!

Select Phone means business.

There's no limit to the ways Select Phone can make your business grow. Call and order now. Take 30 days to make absolutely sure you love it. Then don't be surprised when you find all the prospects you can handle. Set your marketing goals high. Reach them with Select Phone.

10 Generate multiple mailing lists. Select Phone comes with unlimited downloading and unlimited use. Which means you can use as many listings as you want, whenever you

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Contains the city for each listing

ZIP Code Field
Shows 5-digit ZIP and ZIP+4 where available

SIC Code Field
Contains SIC Codes, corresponding to business headings from the Yellow Pages

County Field
Lists every county in the U.S. for territory searches

Pub Date Field
Displays the date the listing was published in a printed phonebook

Name Field
Indicates if listing is residential or business

Address Field
Includes street number & name, and East, West, North, or South location

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Telephone Field
Provides the phone number, including area code

Distance - Closest Field
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MSA Field
Search the Greater Metro Area of any city you choose

City	ZIP	SIC	County	Pub Date	Name	Address	State	Telephone	Distance	MSA
Westport	06884-4287	00000-2000	06884-4287	1/95	Westport	Westport	CT	203-224-6000	0.0 mi	Westport
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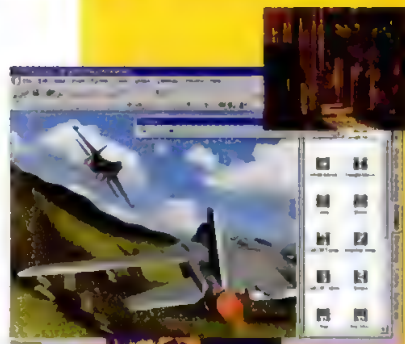


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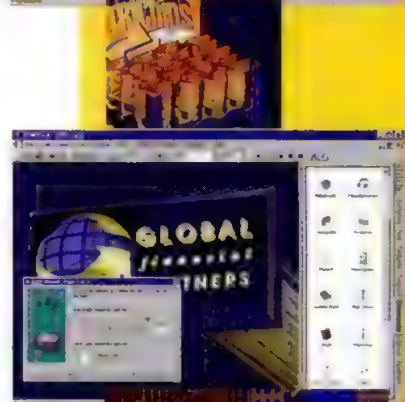


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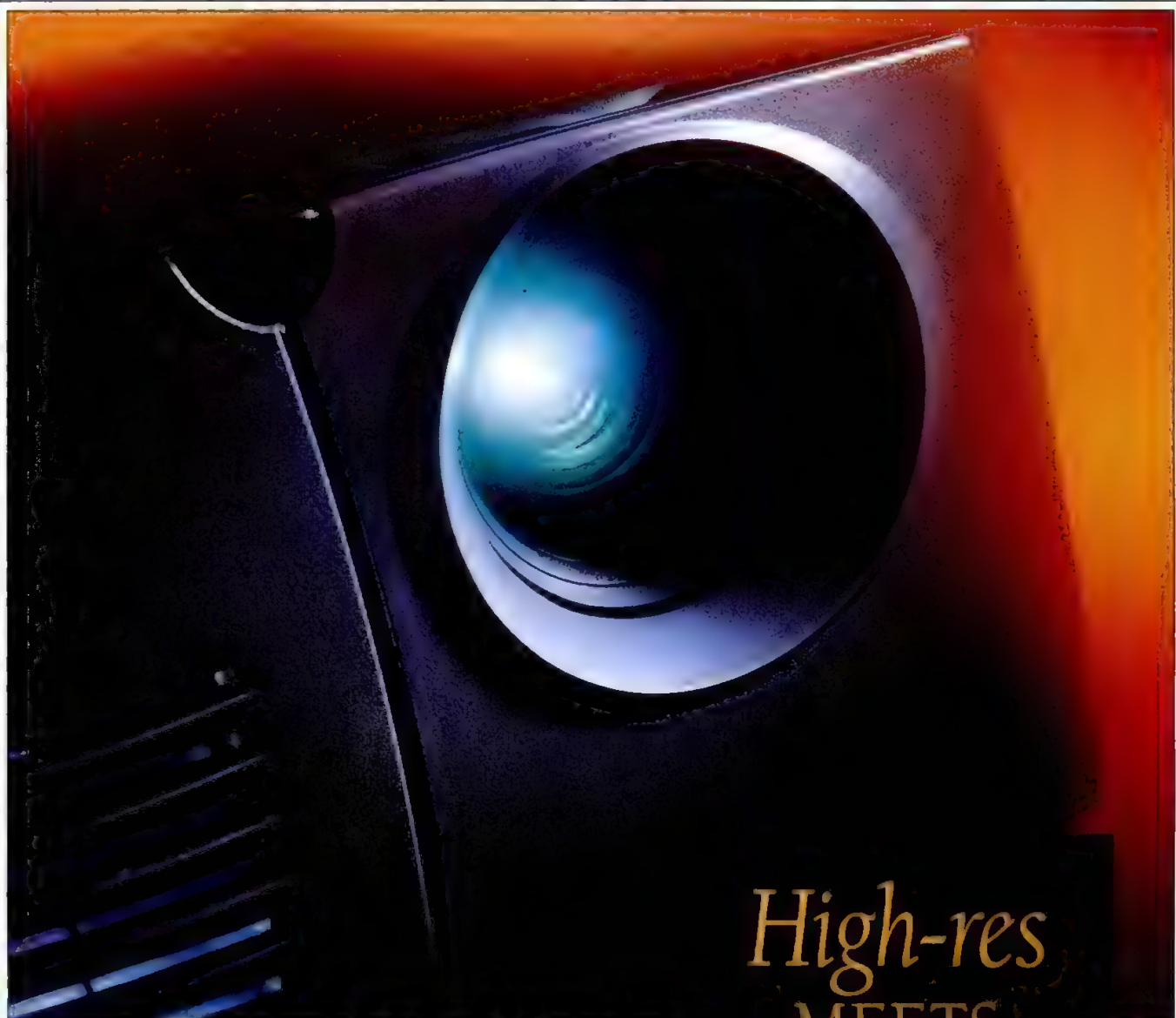
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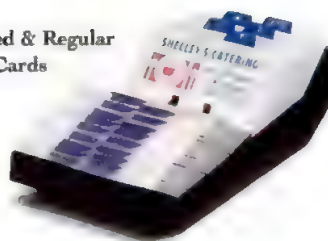


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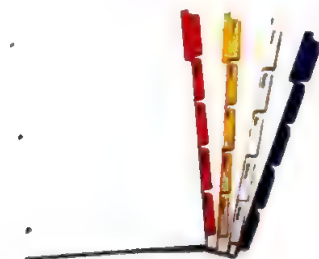
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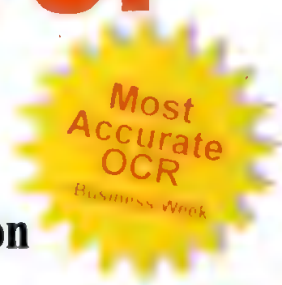
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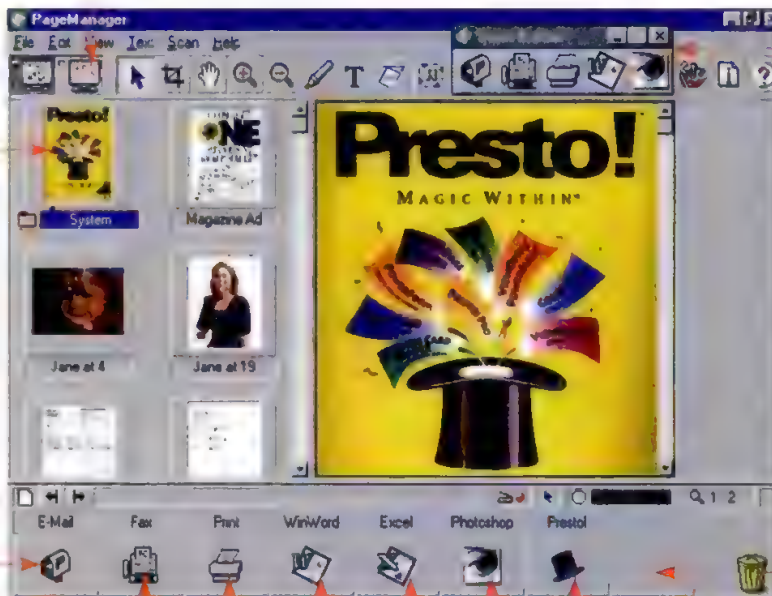
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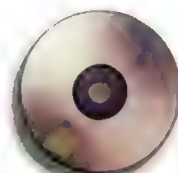
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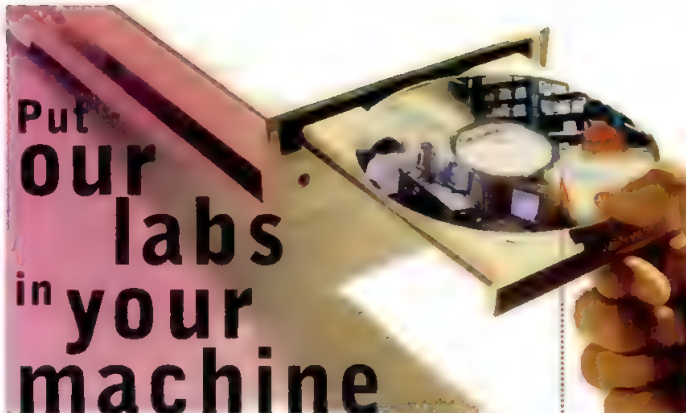
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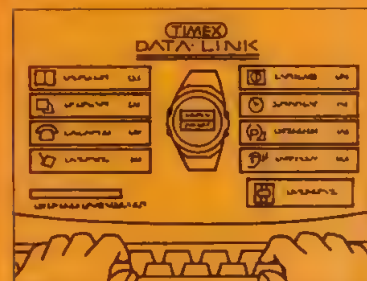
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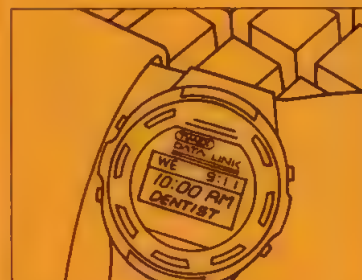
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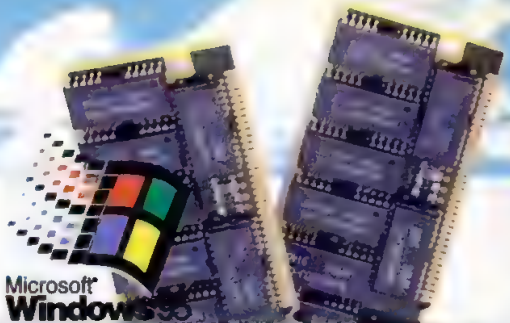
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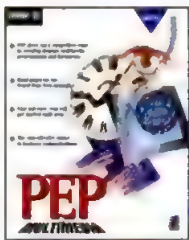
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PC Tech/Power Programming

By Jeff Prosise

Cool Graphics, Hot Code

Seven ways to streamline graphics programming in Win32.

Computer graphics with complicated visual effects often require equally complicated code. Even a simple task such as displaying a bitmap is not quite so simple if the bitmap contains more colors than the video hardware can display.

One of the secrets to writing good graphics code is knowing your API. The Win32 API offers a rich assortment of functions for drawing graphical images, but unless you take time to explore its nooks and crannies, you're liable to overlook some world-class shortcuts. For example, did you know that with one function call you can create a color palette that does a reasonable job of representing true-color images on 256-color screens? Did you know that StretchBlt can be used to dither bitmapped images in Windows NT? Or that you can say good-bye to owner-draw hassles in Windows 95 and create graphical push buttons with a mere two lines of code?

Too many Win32 programmers with roots in 16-bit Windows are still doing things the hard way. Making the API work for you instead of duplicating what's already there reduces the amount of code you write and frees up more time for working on other parts of the application. And very often it produces more robust code as well. In this article, I'll present seven techniques that Win32 programmers can use to create slick graphics with a minimum of code.

You can download all source and program code from PC Magazine Online. See the sidebar "Guide to Our Utilities" in this issue's Utilities column for instructions.

INSTANT COLOR PALETTES

When Windows displays a bitmap on a 256-color display adapter, it maps each color in the bitmap to

one of 20 static colors in the system palette. Unless the colors in the image correspond exactly to the colors in the system palette, the image will undergo some degree of color degradation. Bitmaps that use 16, 24, or 32 bits per pixel to encode color information suffer the most because they typically contain

thousands of different colors.

You can dramatically improve the quality of bitmapped images displayed on 256-color video hardware by creating a logical palette, selecting it into a device context, and realizing the palette prior to blitting the bitmap to the screen. The challenge is to select the palette colors correctly. If the image contains 256 or fewer colors, the palette colors can be matched exactly to the colors in the bitmap. If the bitmap contains thousands of different colors, various quantization algorithms can be used to pick the optimum set of palette colors based on the colors in the image itself.

The drawback to color quantization is that it requires both time and memory. If color accuracy is not a paramount concern and you just want to display a 16-, 24-, or 32-bpp bitmap on a 256-color screen as quickly as possible without sacrificing too much detail, you can use a generic "halftone" palette created with the CreateHalftonePalette API function. Many programmers don't know the function exists, probably because it wasn't part of the 16-bit Windows API. A 256-color halftone palette contains an evenly distributed rainbow of colors created by mixing six different shades of red, green, and blue. It also contains an assortment of grays and a few nongrays hand-picked to improve image quality.

Using CreateHalftonePalette is simplicity itself. The statement

```
hPalette =  
CreateHalftonePalette (hdc);
```

initializes hPalette with the handle of a halftone palette. If hdc references a 256-color device context, the palette will contain 256 colors, too. If you'd like the palette to contain 256 colors regardless of how many colors the display hardware supports (or if you don't have a DC handle readily available), you can pass CreateHalftonePalette a NULL DC handle, like this:

```
hPalette =  
CreateHalftonePalette (NULL);
```

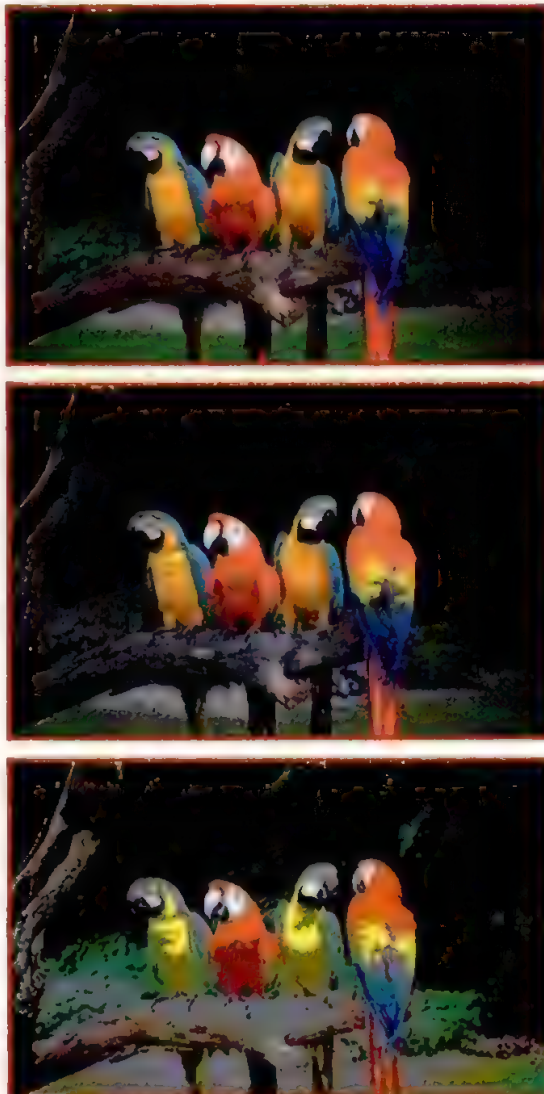


FIGURE 1: A true-color image displayed in its original form (top), on a 256-color screen with a halftone palette (middle), and on a 256-color screen with the default system palette (bottom).

Figure 1 shows the effect of using a halftone palette.

If you're an MFC programmer, be aware that MFC erroneously asserts in debug builds if the MFC equivalent of `CreateHalftonePalette` (`CPalette::CreateHalftonePalette`) is passed a `NULL` `CDC` pointer. Until the bug is corrected, you can work around it by attaching the `HPALETTE` returned by `CreateHalftonePalette` to a `CPalette` object as shown here:

```
CPalette palette;
palette.Attach (
    ::CreateHalftonePalette (NULL));
```

DITHERED BITMAPS

Speaking of bitmaps, have you ever wished the GDI would dither bitmap colors the way it dithers pen and brush colors?

In Windows NT, it's easy to dither images when they're blitted to a device that can't display the full range of image colors. Just call `SetStretchBltMode` to set the `StretchBlt` mode to `HALFTONE` in the destination `DC`, `SetBrushOrgEx` to reset the brush origin, and `StretchBlt` to blit the bitmap to the display surface, like this:

```
SetStretchBltMode (hdc, HALFTONE);
SetBrushOrgEx (hdc, 0, 0, NULL);
StretchBlt (hdc, x, y, cx, cy,
    hdcMem, 0, 0, cx, cy,
    SRCCOPY);
```

In turn, the GDI will use an ordered dither to simulate a richer selection of colors (see Figure 2).

Figure 3 lists the source code for a function named `DitherBlt` that uses this technique to perform a dithered `BitBlt`. Be aware that the `HALFTONE` `StretchBlt` mode



FIGURE 2: A true-color image displayed on a 256-color screen with Figure 3's `DitherBlt` function.

is not supported in Windows 95, despite the fact that calling `SetStretchBltMode` with a `HALFTONE` parameter returns a nonzero value indicating success. Until Windows 95 is upgraded to support the full range of Win32 functionality, you'll have to do your own dithering outside of Windows NT.

TRANSPARENT BLITS

There are several methods Win32 programmers can use to draw bitmaps with "transparent" pixels that don't affect the colors of pixels at the destination. One rather popular technique makes creative use of monochrome device contexts and raster-op codes

to generate a monochrome AND mask and a color XOR mask that are blitted separately to the output `DC`. Another handy technique relies on the masking capability built into Windows NT's `PigBlt` (Parallelogram Blit) function, which, unfortunately, is non-functional in Windows 95.

If your application is targeted for Windows 95 or Windows NT 3.51 or later, you can use image lists to quickly and easily blit images containing transparent pixels to a device context. The source code in Figure 4 shows how. `DrawTransparent` draws the bitmap referenced by `hBitmap` on the display surface represented by `hdc`. `X` and `y` are the coordinates of the bitmap's upper-left corner at the destination, and `crColor` specifies the transparency color. Any pixel in the bitmap whose color equals the transparency color does not get drawn in the destination `DC`. The statements

erenced by `hBitmap` on the display surface represented by `hdc`. `X` and `y` are the coordinates of the bitmap's upper-left corner at the destination, and `crColor` specifies the transparency color. Any pixel in the bitmap whose color equals the transparency color does not get drawn in the destination `DC`. The statements

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```
hBitmap = LoadBitmap (hInstance,
    MAKEINTRESOURCE (IDR_BITMAP));
DrawTransparent (hdc, hBitmap,
    RGB (255, 0, 0), 0, 0);
```

load the bitmap whose resource ID is IDR_BITMAP and blit all nonred (R=255, G=0, B=0) pixels to hdc.

DrawTransparent works by creating an image list containing a masked version of hBitmap and outputting the image to the destination DC with ImageList_Draw. Because ImageList_Draw is called with an ILD_TRANSPARENT flag, pixels whose color corresponds to the mask color crColor are not transferred. Image lists are part of the Win32 common controls library, so if you use DrawTransparent in your own code, be sure to include the header file Commctrl.h and link with Comctl32.lib.

As an aside, note that calling DrawTransparent repeatedly to draw the same image is inefficient, because each call to DrawTransparent regenerates the AND and XOR masks used to draw the image. If the same image is drawn several times (for example, if your application performs animation by repeatedly erasing and redrawing a bitmap image), you can improve performance by creating the image list just once and calling ImageList_Draw as many times as needed.

```
BOOL DitherBlt (HDC hdcDest, int xDest, int yDest, int cx, int cy,
    HDC hdcSrc, int xSrc, int ySrc, DWORD dwRop)
{
    int nOldMode;
    BOOL bResult;

    bResult = FALSE;
    nOldMode = GetStretchBltMode (hdcDest);
    if (SetStretchBltMode (hdcDest, HALFTONE)) {
        SetBrushOrgEx (hdcDest, 0, 0, NULL);
        bResult = StretchBlt (hdcDest, xDest, yDest, cx, cy,
            hdcSrc, xSrc, ySrc, cx, cy, SRCCOPY);
        SetStretchBltMode (hdcDest, nOldMode);
    }
    return bResult;
}
```

FIGURE 3: DitherBlt, a function available for the Windows NT platform, works just like BitBlt, but it automatically dithers colors that can't be displayed directly.



INSTANT DIB SECTIONS

Since Version 1.0, Windows has supported a LoadBitmap function that loads bitmap resources from DLLs and EXEs. The Win32 API includes a newer and more powerful function named LoadImage that does everything LoadBitmap does and more. One of LoadImage's more interesting talents is its ability to create a DIB section—a more versatile form of DIB that's unique to 32-bit Windows—from a .BMP file. With Load-

Image to lend a hand, you can replace all that old code that reads a DIB from a .BMP file and returns an HBITMAP with one simple program statement:

```
hBitmap = LoadImage (NULL,
    pszFileName, IMAGE_BITMAP,
    0, 0, LR_LOADFROMFILE |
    LR_CREATEDIBSECTION);
```

pszFileName is a pointer to the name of the

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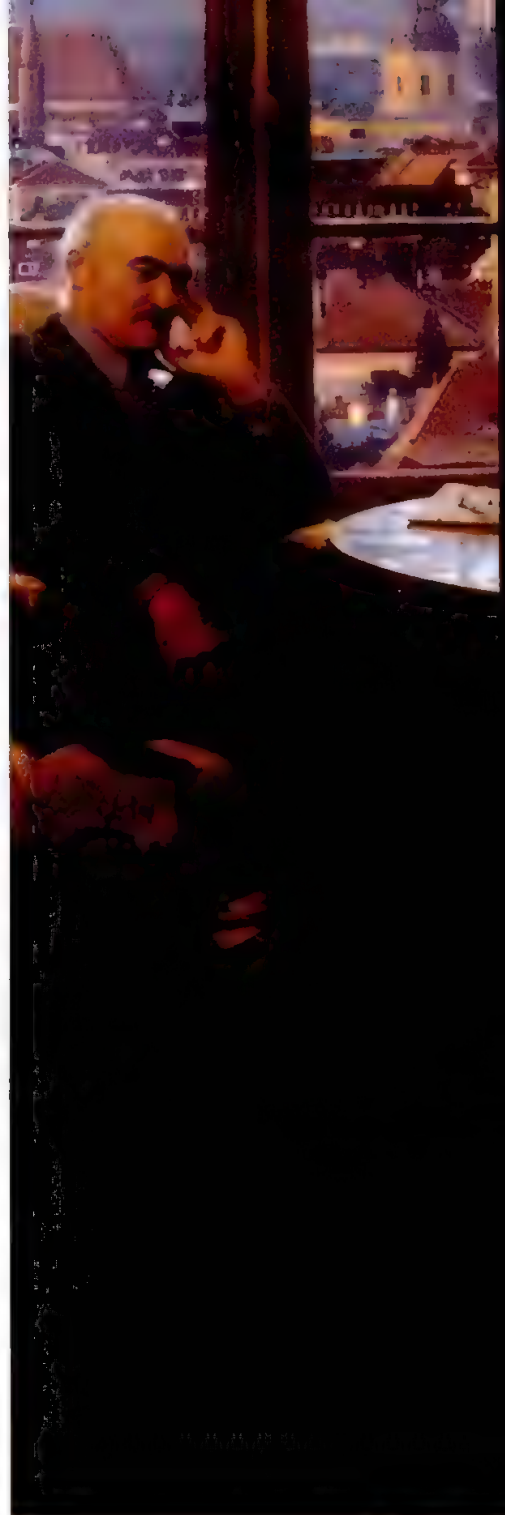


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```
#include <commctrl.h>
// Don't forget to link with Comctl32.lib!
.
.
.
BOOL DrawTransparent (HDC hdc, HBITMAP hBitmap, COLORREF crColor,
    int x, int y)
{
    BITMAP bm;
    HIMAGELIST hImageList;
    BOOL bResult;

    bResult = FALSE;
    if (GetObject (hBitmap, sizeof (bm), &bm)) {
        hImageList = ImageList_Create (bm.bmWidth, bm.bmHeight, ILC_MASK,
            1, 1);
        if (hImageList != NULL) {
            if (ImageList_AddMasked (hImageList, hBitmap, crColor) != -1)
                bResult = ImageList_Draw (hImageList, 0, hdc, x, y,
                    ILD_TRANSPARENT);
        }
        DeleteObject (hImageList);
    }
    return bResult;
}
```



FIGURE 4: The *DrawTransparent* function draws bitmaps and filters out pixels of a specified color.

```
HRGN ClipTextOutline (HDC hdc, int x, int y, LPSTR pszText)
{
    HRGN hRgn1, hRgn2;
    RECT rect;

    BeginPath (hdc);
    TextOut (hdc, x, y, pszText, strlen (pszText));
    EndPath (hdc);

    hRgn1 = PathToRegion (hdc);
    GetRgnBox (hRgn1, &rect);
    hRgn2 = CreateRectRgnIndirect (&rect);
    CombineRgn (hRgn2, hRgn2, hRgn1, RGN_DIFF);

    DeleteObject (hRgn1);
    return hRgn2;
}
```



FIGURE 5: *ClipTextOutline* converts a text string into an *HRGN* that can be used for stylized text output.

.BMP file that contains the image. A NULL return from *LoadImage* means the function failed. The most common causes of failure are passing *LoadImage* a nonexistent file name and passing it the name of a file that does not contain a valid bitmap.

STENCILED TEXT OUTPUT

When text is drawn to a display surface using *DrawText*, *TextOut*, and other text output functions, the GDI fills the characters in the text with the device context's current text color. With a little work, it's also possible to draw stylized text that's filled with a brush pat-

tern or "cut out" of another image. The secret is to use GDI path functions to create a path from the text outline, and then either to fill the interior of the path directly or to use it as a clipping region for other GDI output functions.

The *ClipTextOutline* function in Figure 5 does the hard part for you. Given a text string and a set of x-y coordinates specifying the text origin, it returns an *HRGN* representing the text outline. It first creates a path from the text string by placing a call to *TextOut* between calls to *BeginPath* and *EndPath*. Because a path created by *TextOut* is a rectangle with the letters comprising the text string stamped out

in the middle, *ClipTextOutline* then converts the path into a region and turns the region inside out by subtracting the region from the region's own bounding box. The resulting region is an exact duplicate of the original text outline. It can be selected into a device context and used as a clipping region by passing its handle to *SelectClipRgn*. Or it can be rendered directly with *FillRgn*, *FrameRgn*, and other region-based drawing functions.

The following code sample creates a pattern brush from the bitmap resource *IDR_BITMAP* and uses it to fill a region created from the text string "Hello, world." The text origin is the point (0,0) in the device context whose handle is *hdc*:

```
hBitmap = LoadBitmap (hInstance,
    MAKEINTRESOURCE (IDR_BITMAP));
hBrush =
    CreatePatternBrush (hBitmap);
hRgn = ClipTextOutline (hdc, 0, 0,
    "Hello, world");
FillRgn (hdc, hRgn, hBrush);
DeleteObject (hRgn);
DeleteObject (hBitmap);
```

ClipTextOutline uses the font that is currently selected into the device context to generate the *HRGN*. As this example demonstrates, it is the caller's responsibility to delete regions created with *ClipTextOutline*.

The sample program in Figure 6 uses *ClipTextOutline* to draw gradient-filled text. The output is shown in Figure 7. The core code is found in the application's *WM_PAINT* handler, which creates a region from the text outline, selects the region into the device context so that it becomes a clipping region, and paints a rectangular block of pixels with a gradient fill that fades smoothly from cyan to black. Because pixels outside the clipping region are clipped from the output, only pixels that fall inside the text outline are filled. After the drawing is done, the clipping region is selected out of the device context and deleted to prevent memory leaks.

NONRECTANGULAR WINDOWS

One of the most interesting of all the Win32 API functions is *SetWindowRgn*, which converts an ordinary region into a "window region" that defines the contour of a window. One use for *SetWindowRgn* is to create nonrectangular windows like the one shown in Figure 8. The window is a top-level window whose border and caption bar are hidden because they lie outside the window region. The region was created with *ClipTextOutline* from a string containing just one character—a 144-point version of character number 255 in the Wingdings character set. The window's client area is painted with a gradient fill that produces a red-to-black fade from top to bottom. A *WM_NCHITTEST* handler converts

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```
#include <windows.h>

LRESULT CALLBACK WndProc (HWND, UINT, WPARAM, LPARAM);
HRGN ClipTextOutline (HDC, int, int, LPSTR);
void DoGradientFill (HDC, PRECT);

// WinMain

int WINAPI WinMain (HINSTANCE hInstance, HINSTANCE
hPrevInstance,
LPSTR lpszCmdLine, int nCmdShow)
{
    static char szAppName[] = "Stenciled Text Demo";
    WNDCLASS wc;
    HWND hwnd;
    MSG msg;

    wc.style = CS_HREDRAW | CS_VREDRAW;
    wc.lpfnWndProc = (WNDPROC) WndProc;
    wc.cbClsExtra = 0;
    wc.cbWndExtra = 0;
    wc.hInstance = hInstance;
    wc.hIcon = LoadIcon (NULL, IDI_APPLICATION);
    wc.hCursor = LoadCursor (NULL, IDC_ARROW);
    wc.hbrBackground = (HBRUSH) (COLOR_3DFACE + 1);
    wc.lpszMenuName = NULL;
    wc.lpszClassName = szAppName;

    RegisterClass (&wc);

    hwnd = CreateWindow (szAppName, szAppName,
        WS_OVERLAPPEDWINDOW, CW_USEDEFAULT,
        CW_USEDEFAULT, CW_USEDEFAULT,
        CW_USEDEFAULT, HWND_DESKTOP, NULL, hInstance,
        NULL);

    ShowWindow (hwnd, nCmdShow);
    UpdateWindow (hwnd);

    while (GetMessage (&msg, NULL, 0, 0)) {
        TranslateMessage (&msg);
        DispatchMessage (&msg);
    }
    return msg.wParam;
}

// Window procedure

LRESULT CALLBACK WndProc (HWND hwnd, UINT msg, WPARAM
wParam, LPARAM lParam)
{
    HDC hdc;
    PAINTSTRUCT ps;
    static char szText[] = "GDI";
    HFONT hFont, hOldFont;
    int nHeight, x, y;
    HRGN hClipRgn;
    RECT rect;
    SIZE size;

    switch (msg) {
        case WM_PAINT:
            hdc = BeginPaint (hwnd, &ps);

            // Create a 144-point bold Arial font
            nHeight = -((GetDeviceCaps (hdc, LOGPIXELSY) *
144) / 72);
            hFont = CreateFont (nHeight, 0, 0, 0, FW_BOLD, 0,
0, 0,
            DEFAULT_CHARSET, OUT_CHARACTER_PRECIS,
            CLIP_CHARACTER_PRECIS, DEFAULT_QUALITY,
            DEFAULT_PITCH | FF_DONTCARE, "Arial");

            // Select the font into the DC
            hOldFont = (HFONT) SelectObject (hdc, hFont);

            // Compute a text origin that will produce
            // centered text
            GetTextExtentPoint32 (hdc, szText, lstrlen
(szText), &size);
            GetClientRect (hwnd, &rect);
            x = (rect.right - rect.left - size.cx) / 2;
            y = (rect.bottom - rect.top + nHeight) / 2;

            // Create a text outline and use it as a clipping
            // region
            hClipRgn = ClipTextOutline (hdc, x, y, szText);
            SelectClipRgn (hdc, hClipRgn);

            // Perform a gradient fill around the clipping
            // region
            SetRect (&rect, x - 4, y - 4, x + size.cx + 4, y
- nHeight + 4);
            DoGradientFill (hdc, &rect);

            // Delete the clipping region and the font
            SelectClipRgn (hdc, NULL);
            DeleteObject (hClipRgn);
            DeleteObject (SelectObject (hdc, hOldFont));

            EndPaint (hwnd, &ps);
            return 0;

        case WM_DESTROY:
            PostQuitMessage (0);
            return 0;
    }
    return DefWindowProc (hwnd, msg, wParam, lParam);
}

// Helper routines

HRGN ClipTextOutline (HDC hdc, int x, int y, LPSTR
pszText)
{
    HRGN hRgn1, hRgn2;
    RECT rect;
```

(continues)

FIGURE 6: The sample program, *Textdemo.c*, uses *ClipTextOutline* to draw gradient-filled text.

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```

BeginPath (hdc);
TextOut (hdc, x, y, pszText, lstrlen (pszText));
EndPath (hdc);

hRgn1 = PathToRegion (hdc);
GetRgnBox (hRgn1, &rect);
hRgn2 = CreateRectRgnIndirect (&rect);
CombineRgn (hRgn2, hRgn2, hRgn1, RGN_DIFF);

DeleteObject (hRgn1);
return hRgn2;
}

void DoGradientFill (HDC hdc, PRECT pRect)
{
    int i, nWidth, nHeight;
    HBRUSH hBrush[64];
    RECT rect;

```

```

    for (i=0; i<64; i++)
        hBrush[i] = CreateSolidBrush (RGB (0, 255 - (1 *
            4), 255 - (1 * 4)));

    nWidth = pRect->right - pRect->left;
    nHeight = pRect->bottom - pRect->top;

    for (i=0; i<nHeight; i++) {
        SetRect (&rect, pRect->left, i + pRect->top,
            pRect->right,
                i + pRect->top + 1);
        FillRect (hdc, &rect, hBrush[(i * 63) /
            nHeight]);
    }

    for (i=0; i<64; i++)
        DeleteObject (hBrush[i]);
}

```



FIGURE 6 (CONT.)

HTCLIENT hit-test codes into HTCAPTIONS so the window can be dragged by its client area. The end result is an unusual application whose window is a replica of the Windows logo. Because of space constraints, the source code is only available online.

You probably won't find many practical uses for such odd-shaped windows, but they sure make for some eye-popping demos. And the very fact that it can be done means someone will find a use for it—guaranteed.

EASY GRAPHICAL BUTTONS

It's not difficult to create owner-drawn push buttons that have pictures instead of text on their faces, but doing it right takes more effort than many programmers realize. One problem with owner-drawn buttons is that each button's owner is responsible for drawing the entire button face. If the button border style changes (as it did in Windows 95), owner-draw code has to be revamped to reflect the new style. Another problem with owner-drawn push buttons is that most of them use bitmaps to depict the buttons in their various states. The colors used to draw the button face and borders are hard-coded into the bitmaps and don't change if the system colors change unless special code is included to sense color changes and update the colors in the bitmaps accordingly.

Windows 95 introduced two new button styles that make graphical push buttons easier to create than ever before. The BS_ICON button style creates a graphical push button from an icon, and the BS_BITMAP style creates a graphical push button from a bitmap. You supply the icon or bitmap that you want displayed on the button face, and Windows does the rest. You don't have to process WM_OWNERDRAW messages, supply images for the button's up, down, focused, and disabled states, or worry about what the button's

borders look like, because the operating system handles these details for you. If you use the BS_ICON style instead of BS_BITMAP, you needn't concern yourself with changes in button colors, either, because you can code transparent pixels directly into the icon image.

It's easy to create a BS_ICON button. First create the button itself, either by calling CreateWindow or CreateWindowEx or including a PUSHBUTTON statement in a dialog template. Be sure to include BS_ICON in the button style. Then assign the button an icon by sending it a BM_SETIMAGE message with

wParam set to 0 and lParam holding the icon handle. The following code fragment creates a BS_ICON button in a dialog box. The button face is emblazoned with the Windows logo instead of a text string:

```

// In the dialog template
PUSHBUTTON "", IDC_BUTTON, 8, 8,
    48, 24, WS_GROUP | BS_ICON

// In the WM_INITDIALOG handler
hIcon = LoadIcon (NULL,
    MAKEINTRESOURCE (IDI_WINLOGO));
SendMessage (GetDlgItem (hDlg,
    IDC_BUTTON), BM_SETIMAGE, 0,
    (LPARAM) hIcon);

```

BS_BITMAP buttons work the same way, except you substitute BS_BITMAP for BS_ICON and pass a bitmap handle instead of an icon handle in the BM_SETIMAGE message's lParam. The advantage to BS_BITMAP buttons is that bitmaps can be of any size, whereas icons are restricted to 16, 32, or 48 pixels square. The disadvantage is that pixels in the bitmap that are painted the color of the button face aren't automatically updated if the user changes the button color.

With the BS_ICON and BS_BITMAP button styles to lend a hand, there's no need to do owner-drawn push buttons ever again, unless your code must be compatible with earlier versions of Windows. One SendMessage call can replace the dozens of lines of code required to process WM_OWNERDRAW messages and update button images in response to WM_SYSCOLORCHANGE messages. □

Jeff Prosise is a contributing editor of PC Magazine. His recent book, *Programming Windows 95 with MFC*, is available from Microsoft Press.

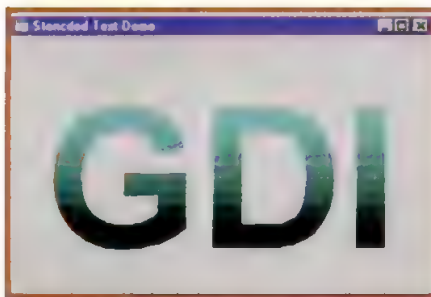


FIGURE 7: The gradient-filled text produced by Figure 6's TextDemo program.

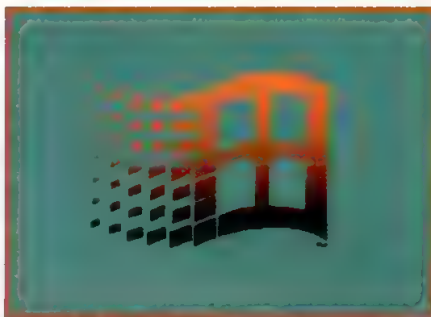


FIGURE 8: The SetWindowRgn API function can be used to create windows with unusual shapes, like the logo window shown here.

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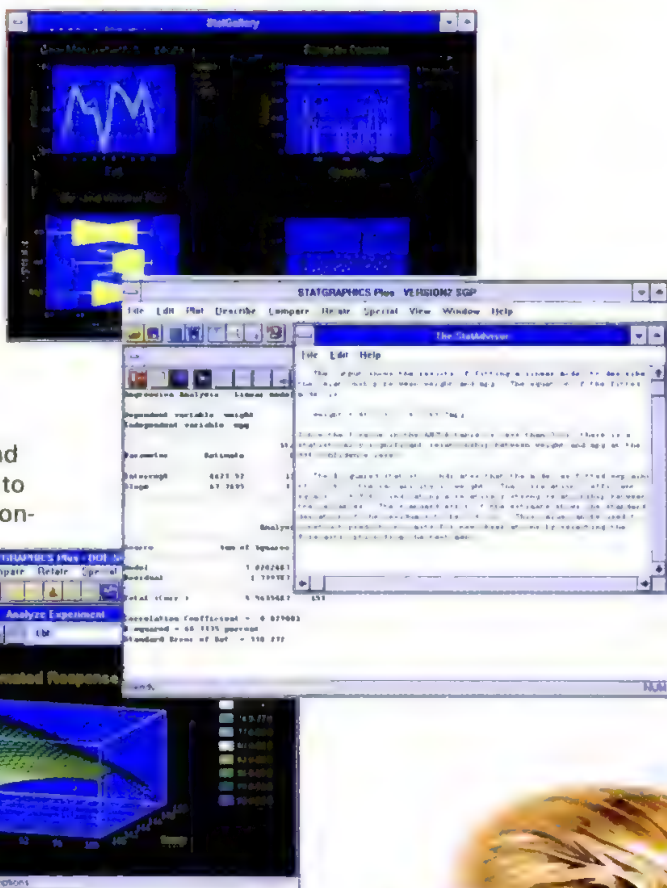
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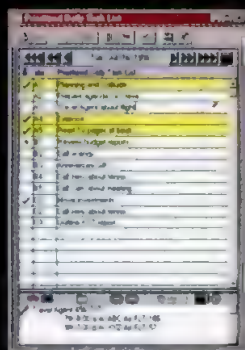
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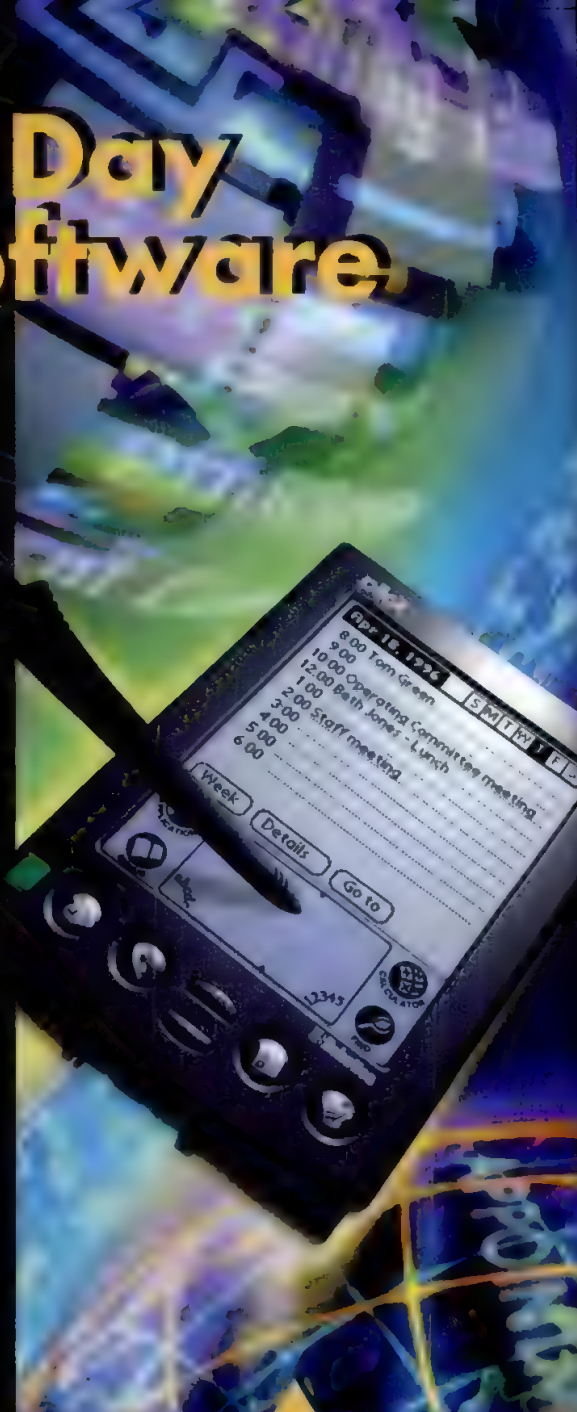
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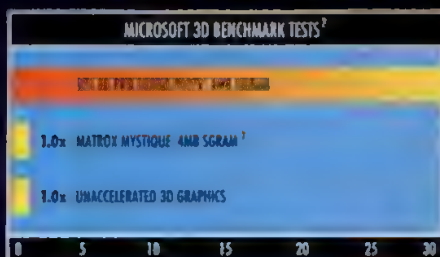
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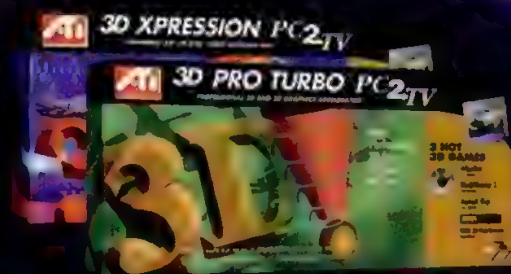
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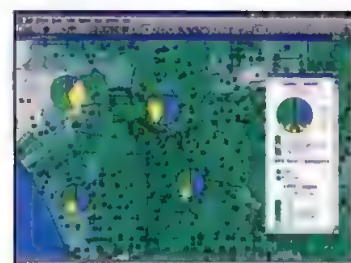
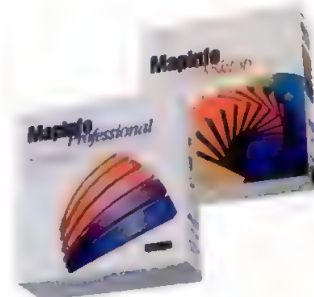
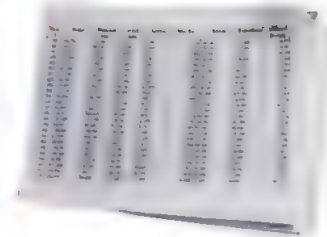


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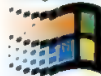
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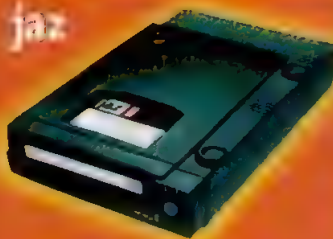
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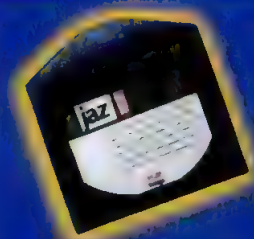


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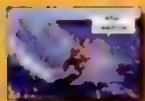
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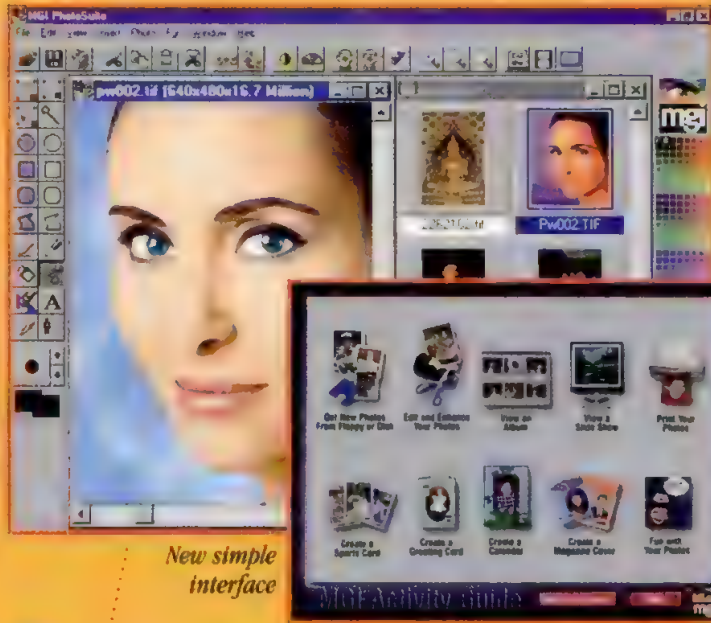
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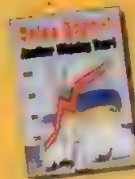
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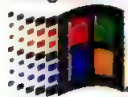
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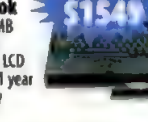
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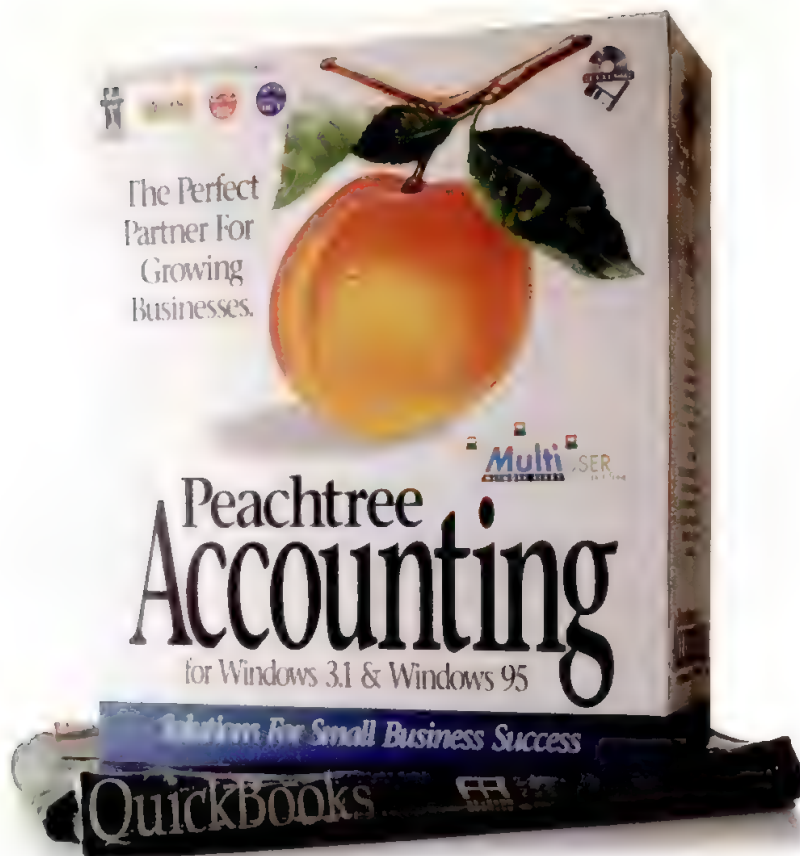
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By Neil J. Rubenking

MonSys Monitors Windows 95

MonSys improves on the Windows 95 System Monitor utility.

The System Monitor utility (Sysmon.exe) that comes with Windows 95 displays system performance statistics in text or graphical form. System Monitor is nothing but a display tool; the performance data is supplied by Windows 95 itself. MonSys, this issue's utility, draws on the same source as System Monitor but presents the data using a much more flexible user interface.

In both System Monitor and MonSys, each performance statistic is represented by a self-contained display element. Windows 95 breaks down the performance statistics it supplies into several categories, such as Kernel, Memory Manager, and File System. System Monitor displays all data in the same window, regardless of each item's category, but MonSys improves readability by assigning a separate display page to each category. System Monitor can become cluttered with inactive display elements; MonSys provides a number of ways to filter out inactive data. MonSys also offers more display options than System Monitor, and lets you control the display of each item separately.

Like System Monitor, MonSys works *only* with Windows 95; it is not compatible with Windows 3.1 or Windows NT. You can download MonSys and its source code from PC Magazine Online or obtain it by mail. (Refer to the sidebar "Guide to Our Utilities" for details.) The source code for MonSys, which was written with Delphi, Borland's 32-bit visual programming tool, is provided for those interested in seeing how it works.

INSTALLING MONSYS

To install MonSys, copy the program files MonSys.exe, MonSys.hlp, and MonSys.cnt into the directory of your choice. Launch the program with the Start menu's Run command or from a command prompt. If you decide you want MonSys working for you all the time, add it to the StartUp folder, as follows:

1. Launch Explorer and navigate to the directory that contains MonSys.exe.
2. Click on MonSys.exe and drag it to the Start button.
3. Right-click on the Start button and select Explore. Note that a MonSys.exe shortcut is visible in the right-hand pane of Explorer.

4. In the left-hand pane, open the Programs folder below the Start menu.

5. Drag the MonSys.exe shortcut to the Start-Up folder, below the Programs folder.

Now MonSys will start every time you start Windows 95.

If you later decide to uninstall MonSys, you should first remove the Registry entries that it uses for tracking options and display preferences. To do so, select Run from the Start menu and enter the command MonSys CleanRegistry. You may need to spell out the full pathname for MonSys—for example, c:\utils\MonSys CleanRegistry. After removing the Registry entries, you can delete the

IN THIS ISSUE

MonSys

MonSys improves on System Monitor by placing different categories of system performance statistics on separate display pages and by providing a multitude of features to customize their display.



three MonSys files and remove MonSys from the StartUp folder.

USING MONSYS

The only immediately visible sign that MonSys has been launched is the appearance of its icon in the system tray. Click on the icon to bring the main window into view (see Figure 1), then flip through the pages to see just what kind of performance data is supplied by Windows 95. Right-click on any item and select What's This? for an explanation of that particular statistic. Note that the explanation, like the value itself, is supplied by Windows 95, not by MonSys.

When you close the main window, MonSys will retreat to the Taskbar. To terminate MonSys completely, select Exit from the Monitor menu, press the Exit speed button, or right-click on the Taskbar icon and choose Exit

from the context menu. You can suspend monitoring without terminating MonSys by choosing Stop Monitoring from the Monitor menu, and start again by choosing Begin Monitoring. These two items also appear on the icon's context menu, and they have corresponding speed buttons on the main window. If MonSys is not active, it displays itself as a sleepy-eyed icon; if active, the icon is a face with wide-awake eyes that are constantly looking around (see Figure 2).

Performance statistics are dynamic, and your MonSys display may not be the same as your neighbor's. Depending on your system's configuration, you will probably have from three to six pages of data. Every system should include the Kernel, Memory Manager, and File System pages. Network-enabled systems will have more pages, with names like Microsoft Network Client, Microsoft Client for NetWare Networks, and IPX/SPX Compatible Protocol. Other pages of information can come and go dynamically. For example, when a 32-bit communications program using a 32-bit modem driver is active, you'll generally see a page named for the modem driver showing bytes sent and received.

MonSys includes a number of features that help keep its display relevant as system usage changes. By default, all of these features are active, but items on the Options menu let you selectively turn some of them off. If a system statistic becomes unavailable, MonSys will remove the corresponding display element, unless you uncheck the Auto-Remove If Stat Lost item. A statistic whose value does not change for 5 minutes will be placed in the last position on its page, unless you uncheck the Auto-Demote If Not Changing item. Note that if the demoted item's value changes, it will be moved again, this time to a position just before all unchanging items. If every item on a page is unchanging, the page will be hidden, unless you uncheck Auto-Hide Unchanging Page. Finally, MonSys will check for the appearance or disappearance of categories and data items once per minute, unless you uncheck the Auto-Refresh Once a Minute item. The remaining two items on the Options menu control whether MonSys will start monitoring immediately upon loading or wait for you to start it, and whether it will

sound a siren when an alarm condition occurs (more on alarms later).

If you've turned off the features that automatically refresh MonSys's display, you will occasionally want to choose Refresh All from

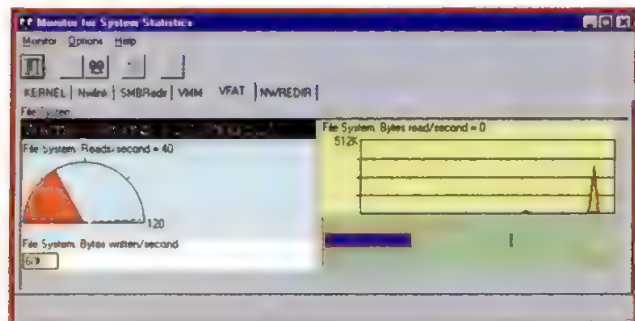


FIGURE 1: MonSys lets you adjust the display of system performance statistics to suit your personal preferences.

the Monitor menu or click on the Refresh All speed button. This option destroys the existing pages and rebuilds them from the ground up. The Reset Alarm menu choice (along with its corresponding speed button) restores the ordinary MonSys display after you've dealt with an alarm condition.

SETTING OPTIONS

Right-click on a display item to activate a pop-up menu that lets you control nine properties associated with the particular performance statistic being tracked. These properties are stored in the Registry, so that if system information for a data item disappears and later reappears, the item will be displayed using the previously selected properties. The nine property-setting menu choices are discussed below.

The Alarms property lets you activate an alarm when the data item's value goes above or below a certain limit. For example, you may wish to be informed if the swap file size rises above 50MB or if the amount of free memory sinks below 2KB. If the Options | Audible Alarm menu item is checked, MonSys sounds a brief siren when an alarm condition occurs (if a .WAV sound file is not available, it beeps the speaker). The MonSys Taskbar icon changes to an alarmed face (see Figure 2), and the icon's ToolTip spells out the reason for the alarm condition. The main window pops into view with the data item that caused the alarm visible, and the display element's fill color flashes twice a second. The on-screen brouhaha continues until you press the Reset Alarm button or choose Reset Alarm from the Monitor menu. Note that resetting the alarm simply clears the alarm display. The alarm will sound again if the data item's value swings back across the high or low limit into the normal range and then goes past the limit again.

The Background Color property lets you customize the background color for each item individually. By default, all display elements

use the MonSys program's background color, which is the system button-face color—often a light gray, but it could be any color, depending on your color scheme. (It's best to avoid dithered colors, because text against a dithered background is hard to read.) In Figure 1, the five items shown have their Background Color properties set to black, pale blue, white, pale yellow, and pale green.

The Display Mode property lets you change how the value of each data item is displayed. The Windows 95 System Monitor utility can display performance statistics as a time-based chart

of values, a bar chart that includes the recent maximum, or plain text, with the actual value displayed in a colored box. All of the statistics are displayed in whatever mode you choose. MonSys offers the same three display modes, adds a plain text mode and a "gas gauge" mode, and lets you set each item's display mode separately. In Figure 1, the modes used for the five data items (from top to bottom and left to right) are Text, Gas Gauge, Boxed Text, Chart, and Bar.

The text is built from up from four elements: Category, Statistic Name, Statistic Value, and Recent Peak. The Display Elements property lets you choose which of these four to display. In the Chart display mode, the Recent Peak element is ignored, as it is visible in the chart. In the Bar mode, the Recent Peak is displayed as a small bar floating to the right of the main bar. And in the Gas Gauge mode, the Recent Peak is displayed as a dotted line within the gauge.

The meaning of the Divisions property



FIGURE 2: The MonSys icon in the system tray indicates the program's status: monitoring (wide-eyed), not monitoring (sleepy), or signaling an alarm (excited).

depends on the display mode. In the Chart mode, it controls the number of horizontal dividing lines; in the Bar and Gas Gauge modes, it controls the number of tick marks. This property can range from 0 to 9.

The Fill Color property determines what

color is used to display the data. It is irrelevant in plain text mode. In Boxed Text mode, it controls the box color, and in the remaining three modes it controls the color used in the graph itself. For example, in Figure 1, the items using Gas Gauge, Boxed Text, Chart, and Bar modes use red, yellow, orange, and blue, respectively, for their fill colors.

The Font property controls the font used to display the item's text. In addition, the font color is used as the color for any lines drawn. For example, the item in Bar mode in Figure 1 has its font color set to red, so the text and border lines are all red.

By default, each item is updated every second. You can use the Interval property to change this. The options range from 1 second to 1 hour.

The Scale property controls the range of values tracked for each system statistic. This can vary widely, from a few dozen to many millions. By default, the Automatic Scaling radio button is selected, and the display of each item is adjusted so the current set of values fits properly. If you select the Fixed Scale radio button, the data will be displayed using the maximum value entered in the edit box. Note that if you set the maximum value too low, you won't be able to see all the data. And if you set it too high, the data points may be too close to 0 to show up. The most logical use for fixed scaling is for an item whose range is fixed. For example, the Processor Usage item on the Kernel page, which is expressed as a percentage, cannot go above 100.

In addition to the above nine properties, the right-click menu includes four other items. The Restore Defaults option resets all the properties to their default values. The What's This? item invokes a pop-up Help panel that explains the statistic being tracked; the explanation is supplied by Windows, as mentioned earlier. The Make Page Same option lets you apply the properties you've chosen for the current item to the other items on the page. The Make All Same option lets you apply the selected properties to all items on all pages.

PROGRAMMING MONSYS

MonSys was written using Borland's 32-bit Delphi 2.0, and most of the source code is encapsulated in Delphi 2.0 components. Delphi programmers can install and use these components in their own programs. Unzip the source code into the directory you use for third-party components. If you haven't yet installed any third-party components, create a directory named PerfComp below the main Delphi 2.0 directory and unzip the files to that location.

Next select Install from the Delphi Component menu. In the resulting dialog box, press the Add button to add the files C_Perfs1.pas through C_Perfs5.pas. When you click on OK, Delphi will add the five compo-



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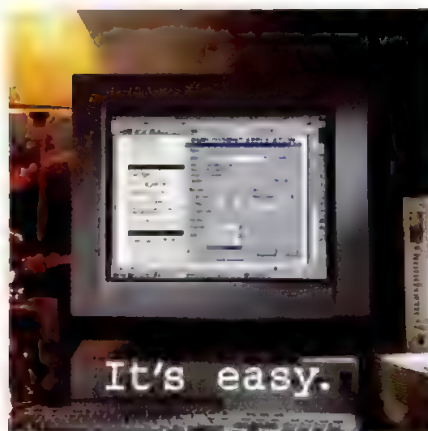
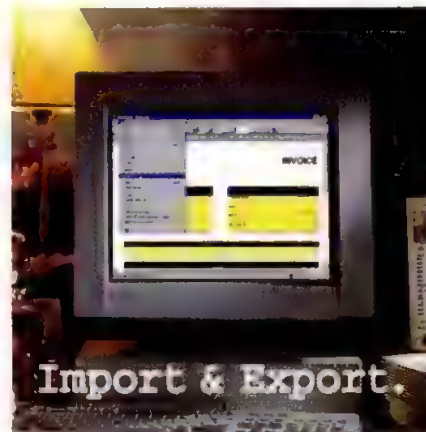
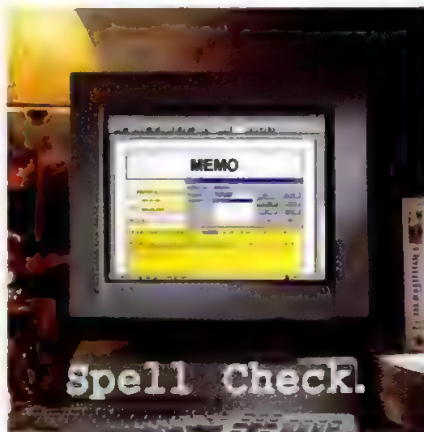
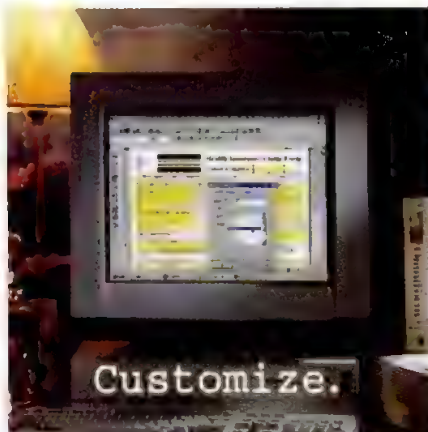
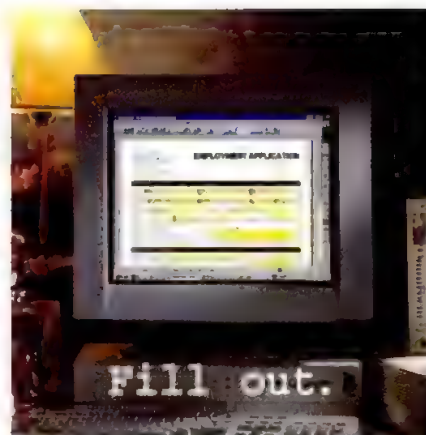


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nents to your component palette, on a page titled PC Mag (see Figure 3).

Before you begin using the components, you'll want to install their help system. Move

ponent hierarchy, no components of this class are ever created, and it does not appear in the component palette. All of its properties are declared as protected, so that the program-

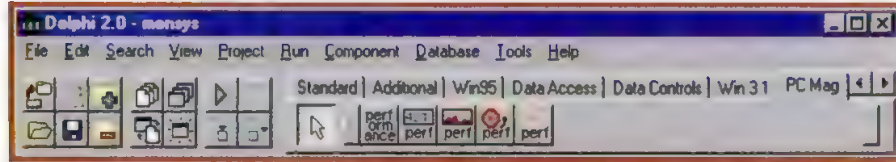


FIGURE 3: Each of the five components on the PC Mag page of Delphi's component palette tracks Windows 95 performance statistics, but each adds a new set of features.

the files C_Perfs.hlp and C_Perfs.kwf to the Help directory below your main Delphi 2.0 directory. Now run Delphi's Helpinst utility, open the Delphi.hdx file, add C_Perfs.kwf to the list of keyword files, and save Delphi.hdx. After performing this last step, you will have integrated context-sensitive help for the new components, their properties, events, and methods.

The performance statistics components are organized in a hierarchy of six separate classes. This makes them easier to understand and saves memory by letting you choose components with only those features you require. Here is an overview of the six classes, each of which is a descendant of the previous one.

COMPONENT CLASSES

TCustomPerfStats, a descendant of the Delphi-supplied class TGraphicControl, queries the Windows 95 Registry to get performance statistics and to get the names, descriptions, and other data about a particular statistic. Following the model of Borland's own com-

mer can choose which properties will be exposed in descendant components. It also handles a system of shared threads that trigger the update of performance statistics. As each statistic component in a project is created, the constructor checks to see if a thread that uses the specified interval already exists. If so, the component is added to the list of components updated by that thread. If not, a new thread is created that activates at the specified interval.

TPerfStats is a nonvisual component that gives you access to the performance data but lets you handle the display yourself. The OnStat event is triggered each time the component checks its data value; the OnStatChange event occurs when the value actually changes. If you also want to handle the update of the performance statistic, you can set the AutoTick property to False and call the public UpdateStat method at regular intervals to get the current value.

TPerfStatsText is a visual component. In fact, a TPerfStats component whose ActiveStat property is True will display the current

value of its data even at design time. It also exposes many properties inherited from TGraphicControl—properties that only make sense in a visual component. This component adds an Auto-Hint property which, if True, automatically copies the server-supplied description of the data item into its Hint property. It also keeps track of the most recent 50 values and returns the maximum of those 50 in its MaxValue property.

The TPerfStatsGraf component implements four new modes for graphically displaying performance data. Its most important properties (DisplayMode, DisplayElements, Divisions, FillColor, and ScaleMax) are explained above, in the discussion on setting properties at run time. To minimize flicker, the code that draws the graphical display modes is divided into two parts: one that draws the unchanging frame, and one that draws the changing data portion. The OnPaint event handler calls both parts, but only the data portion is drawn when updating the statistic.

The TPerfStatsWarn component adds the ability to trigger alarm events based on a data item's value. If the HighLimit property is greater than 0 and the HighActive property is True, the OnAboveValue event will be triggered when the value rises above HighLimit. This event will not be triggered again until the value sinks below HighLimit and then rises above it again. In a similar fashion, the LowLimit and LowActive properties determine when the OnBelowValue event is triggered. Finally, the OnNoActivity event occurs if the number of intervals specified in the

```

program monsys;

uses
  IsLib in 'islib.pas',
  Forms,
  Windows,
  trayicfm in 'Trayicfm.pas' {TrayIconForm},
  monsysu in 'monsysu.pas' {MonSysForm},
  aboutbox in 'aboutbox.pas' {AboutForm};

{$R *.RES}

procedure CheckForWin95;
VAR OSI : TOSVersionInfo;
begin
  OSI.dwOSVersionInfoSize := SizeOf(OSI);
  getVersionEx(OSI);
  IF OSI.dwPlatformID <> VER_PLATFORM_WIN32_WINDOWS THEN
  begin
    MessageBox(0, 'This program runs only under Windows
    =95',
    'MonSys', MB_OK OR MB_ICONSTOP);
    Halt;
  end;
end;

VAR Mutex : THandle;
begin
  CheckForWin95;
  Mutex := CreateMutex(NIL, True, 'PC Magazine MonSys');
  IF GetLastError <> ERROR_ALREADY_EXISTS THEN
  BEGIN
    {get the Application object fully initialized}
    Application.CreateHandle;
    ShowWindow(Application.Handle, SW_HIDE);
    {regular main program body start}
    Application.Title := 'MonSys';
    Application.HelpFile := 'MonSys.hlp';
    Application.ShowMainForm := False;
    Application.CreateForm(TMonSysForm, MonSysForm);
    Application.Run;
    {regular main program body end}
  END;
  ReleaseMutex(Mutex);
end.

```

FIGURE 4: MonSys hides its Application object to avoid having a Taskbar button; it also uses a mutex (mutual exclusion) Windows object to prevent a second instance from starting.




```
function TPerfNameEditor.GetAttributes:
  TPropertyAttributes;
begin
  Result := [paValueList, paSortList];
end;

procedure TPerfNameEditor.GetValues(Proc: TGetStrProc);
var
  CatIndex, KeyIndex : Integer;
  CatList, KeyList : TStringList;
begin
  CatList := TStringList.Create;
  try
    WITH TRegistry.Create DO
      try
        RootKey := HKEY_LOCAL_MACHINE;
        OpenKey(PerfEnumKey, False);
        GetKeyNames(CatList);
        KeyList := TStringList.Create;
        try
```

```
FOR CatIndex := 0 TO CatList.Count-1 DO
  BEGIN
    OpenKey(PerfEnumKey + CatList[CatIndex],
      False);
    GetKeyNames(KeyList);
    FOR KeyIndex := 0 TO KeyList.Count-1 DO
      Proc(CatList[CatIndex]+'\' + KeyList[KeyIndex]);
    END;
  finally
    KeyList.Free;
  end;
  finally
    free;
  end;
  finally
    CatList.Free;
  end;
end;
```



FIGURE 5: The *TPerfNameEditor* object is called by Delphi at design time to display a list of available keynames.

InactiveLimit property passes with no change in the item's value.

The TPerfStatsDeluxe component includes all the abilities of its ancestors plus some additional bells and whistles. Its built-in context menu lets the user set a number of properties at run time and can also bring up a simulated Windows 95 pop-up Help panel with a description of the current item. Using the Registry as a repository, it can load and save selected properties automatically, based on the name of the statistic it's tracking. It even lets the calling program add items to the right-click menu. This is the component used in MonSys's display.

As with most Delphi components, you can use the performance statistic components without a perfect understanding of their inner workings. The Help file included with the components provides details on the properties, events, and methods available to you. Rather than explain each property and method in excruciating detail, we'll look at several topics that are of general interest to Delphi programmers.

USING THE SYSTEM TRAY

The Windows 95 Taskbar has a recessed area at its right (or lower, if it's vertical) end called the system tray. System utilities that run constantly can display an icon in the system tray. In most such utilities, a right-click on the tray icon brings up a menu, while a left-click activates the utility's main window. If the mouse cursor rests on the tray icon, a floating ToolTip window appears.

Since this functionality will be useful in many Delphi programs, I implemented a tray icon form object and placed it in the Object Repository. (The source code for this object is available online.) To create the main form for

a system utility, you simply inherit from the Tray Icon Form.

The public SetupTrayIcon method establishes an ID, an initial icon image, and a ToolTip string for the form. After that, the icon and ToolTip can be changed by referencing the TrayIcon and Tip properties. When the user left-clicks on the tray icon, the form is activated. And if the form's PopupMenu property is non-empty, the pop-up menu will be automatically displayed when the user right-clicks on the icon. Destroying the form removes the tray icon.

All of the necessary calls to the Windows API function Shell_NotifyIcon are handled internally. MonSys's main form calls SetupTrayIcon to establish an ID and an initial icon and ToolTip. To produce the effect of moving eyes, MonSys simply changes the value of the

TrayIcon property at regular intervals.

That's what it takes to get a program into the system tray; now you need to get it out of the regular Taskbar. Delphi 1.0 programs under Windows 95 litter the Taskbar with buttons, one for each window. A Delphi 2.0 program has a single Taskbar button that represents the Application object. MonSys, like any program intended to reside in the system tray, shouldn't have a Taskbar button at all, but the initialization code supplied by Delphi creates the button before any user-written code has a chance to prevent it. MonSys gets around this difficulty by masquerading as a DLL; Delphi doesn't create a Taskbar button for a DLL. The initialization section of the unit Islib.pas, which must come first in the main project file's Uses clause, sets the built-in variable IsLibrary to True. Because of this change, the Application object is initialized as it would be for a DLL. In order to create the Application object but not display it, the main project code explicitly calls the API function ShowWindow, passing the SW_HIDE constant. Figure 4 shows the main project source code for MonSys.

The system tray is specific to Windows 95, so the program halts if the current platform is not Windows 95. Also, there's no point in running two instances of a system monitoring program; in fact, multiple instances can interfere with each other's observations. Thus MonSys needs to avoid running if another instance is already present in memory. 16-bit Windows

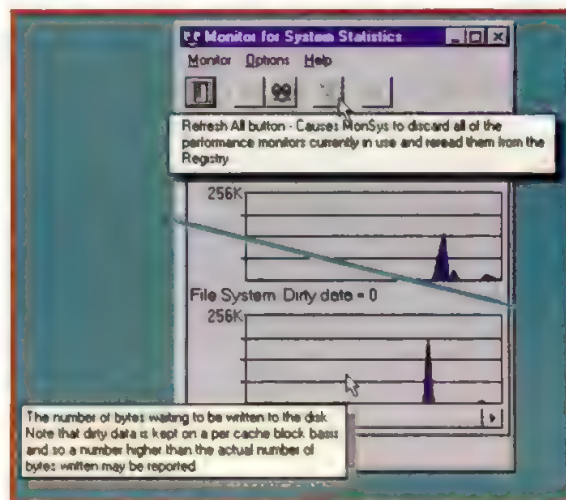


FIGURE 6: The upper half shows an actual pop-up Help panel, and the lower half shows the simulated Help panel used by MonSys.

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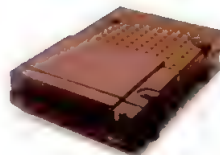
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- 7 **PICALB** Organizes image files
- 8 **1MBF** Protects low memory
- 9 **MULTIL** Adds launch choices in Win 95
- 10 **INCR2** Monitors program installation

programs can simply check for a non-zero value in the Windows-supplied variable `hPrevInst`. However, in a 32-bit Windows program, `hPrevInst` is always 0. Thus `MonSys` has to use a mutex (mutual exclusion) object to make sure only one instance is running.

In short, to create a tray icon program with Delphi, start by inheriting from the `TTrayIconForm`. Then modify the main project source code to match Figure 4, using your own unique string for the mutex name. Add a pop-up menu to the main form, being sure to set its `AutoPop` property to `False`. That's it!

THE KEYNAME PROPERTY EDITOR

The `KeyName` property determines which performance statistic the component will track. A discussion of this essential property will require a bit of background information.

Windows 95 provides access to the performance statistics in the Registry, under the root key `HKEY_DYN_DATA`. However, the data is not actually stored in the Registry. Rather, the performance data in a given category is provided by a server device driver. Each server device driver supplies information to Windows 95 about the data it supports, and each call to get the current value of such data retrieves that value from the server. You can view the performance data in `REGEDIT` by navigating to `HKEY_DYN_DATA\PerfStats\StatData`. In the right-hand panel you'll see a number of values with names of the form `Server\Stat`—for example, `Kernel\CPUsage`. Most of these statistics are available at all times, so pressing F5 repeatedly will display any changes.

Some items, however, must be activated before the system will display changes. For example, before activation, the `Kernel\CPUsage` statistic always displays 64 00 00 00, which represents 100 percent. Strangely enough, the item

is activated by reading the corresponding value in the key `StartStat`. To try it, click on `StartStat`, then on `StatData`. Press F5 repeatedly, and note that the `Kernel\CPUsage` value now changes.

Now navigate to `HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control\PerfStats\Enum`. The subkeys of this key represent the available servers, and each has a value named `Name`, whose data is a descriptive name for the server. Below each server key are keys for each data item handled by that server. These items have values named `Description`, `Differentiate`, and `Name`. `Name` is simply a descriptive name for the statistic, and `Description` is a more lengthy explanation. If `Differentiate` is `False`, the item's value can be reported as is. If it's `True`, the value is cumulative, so a program examining this item should subtract the previous value and divide by the number of seconds between.

The `TCustomPerfStats` component forces the programmer to choose a value for its `KeyName` property that is actually available from the system. If you drop one of the performance data components on a form and click on its `KeyName` property, you'll see a drop-down list of available keys. This list is supplied by the `TPerfNameEditor` object, a property editor devised especially for the `KeyName` property. Figure 5 shows the two essential methods of this object.

When the programmer clicks on the `KeyName` property, Delphi calls the `GetAttributes` method of `TPerfNameEditor` to find out how it should handle this property. The identifiers `paValueList` and `paSortList` indicate that the programmer will choose from a list of values and that the list should be sorted. The `GetValues` method passes all of the possible values to the procedure `Proc`, which it receives from Delphi as a procedural-type parameter. In this case, the `GetValues` method passes the name of each item. You can create a similar property editor for any string property that must be selected from a list of specific values.

When the program sets the `KeyName` property, the `SetKeyName` method is invoked. In this method, values are assigned to the properties `CategoryName`, `Description`, `Differentiate`, and `StatName`. The last three of these are the values of the corresponding key in the `PerfStats\Enum` key; the first is the descriptive name of the server. These read-only properties make it easy for the program to display as much or as little information about an item as is required.

FAKING POP-UP HELP

Windows 95 programs are expected to provide pop-up panel Help using a right-click What's This? menu or the question-mark help icon on the title bar or both. In order to

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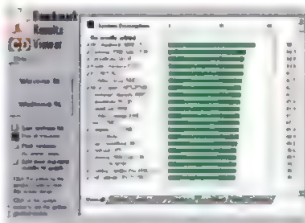
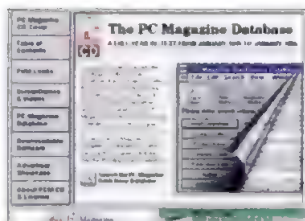
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implement this feature in the usual way, however, the Help text must be compiled into the Help system. Since the descriptions for performance data items are acquired from the system at run time, the usual technique for pop-up-panel Help won't work.

The TFakeHelp form looks remarkably like a regular Help window. The only giveaway that it's different is the fact that its shadow is opaque.

Each project that uses a TPerfStatsDeluxe component will have one instance of the borderless TFakeHelp form type. A call to its SetupHelp method strips any carriage returns and line feeds from the help string passed to it, sizes the form to fit the text, and places it as near as possible to the mouse-click location. The OnPaint event handler paints the form on the screen.

Getting the shadow effect was a particularly tricky problem, because the window

area to be drawn is not rectangular: The text rectangle plus its shadow form a rectangle with two corners cut out. The Win32 API function SetWindowRgn provided a solution to this problem. SetWindowRgn defines a window's visible area as a region that need not be rectangular. In the case of the fake Help window, the region is defined as the union of two rectangles, one offset 8 pixels down from and to the right of the other. The OnPaint handler fills the shadow with the system color defined by COLOR_3DSHADOW, then sets the window region as described. Finally it draws a rectangular border for the text rectangle and word-wraps the text within it, using the system colors defined by COLOR_INFOTEXT and COLOR_INFOBK for the text and background colors. Except for the fact that the shadow is opaque, this is almost precisely the look of the actual pop-up panel. And when the window receives a

mouse click or a key press, or when it loses focus, it hides itself. Figure 6 is a compound screen shot showing an actual pop-up Help panel in its upper half and a simulated Help panel in its lower half.

These system statistic-reporting components will be a welcome addition to the toolbox of any Delphi programmer, and the techniques used in creating them can serve as a model for component creation in general. Programmer or not, any Windows 95 user can get a clearer view into the inner workings of Windows 95 by examining the system data reported by MonSys. And when a problem arises in one of the areas for which the system supplies performance statistics, the alarm feature can aid in tracking down the source of the problem. □

Neil J. Rubenking is technical editor of PC Magazine.

GUIDE TO OUR UTILITIES

ABOUT MonSys...

DESCRIPTION The System Monitor utility provided with Windows 95 is useful but awkward to use, and its display options are limited. MonSys improves on System Monitor by placing statistics in different categories on separate display pages and by providing a multitude of features to customize their display.

USAGE Windows 95 breaks down the performance statistics it supplies into several categories, such as Kernel, Memory Manager, and File System. MonSys assigns a separate display page to each category. Each item in a category is represented by a self-contained display component on the appropriate page. If a particular item's value remains the same for 5 minutes, MonSys demotes it to the last position on the page. If all of the items on a given page have been demoted, MonSys hides the entire page from view. Thus the performance data is automatically organized so that the most active data floats to the top. Selecting Choices on the Options menu lets you turn these view-filtering features on and off.

You can customize the display of each item by right-clicking on it and choosing from the resulting context menu. Your settings will be stored in the Registry and reused the next time MonSys starts. One menu item sets all data items on the current page to the same display settings as the one that triggered the context menu, and another does the same for all items on all pages. The What's This? item on the context menu displays a Windows 95-supplied description of the particular performance statistic.

When not displaying statistics, MonSys resides in the system tray, which is located at the right or bottom end of the Taskbar, depending on the Taskbar's orientation. If MonSys is not active, it displays itself as a sleepy-eyed icon; if the program is active, the icon is a face with wide-awake eyes that are constantly looking around. Right-click on the icon to bring up a menu that lets you start monitoring, stop monitoring, or exit the program.

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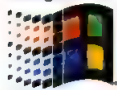
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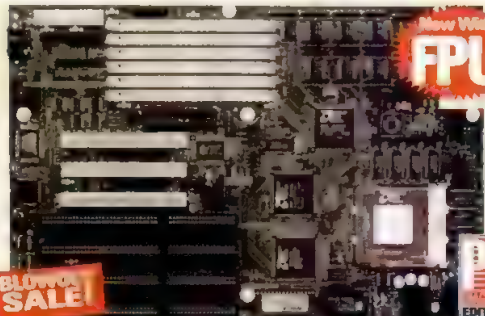


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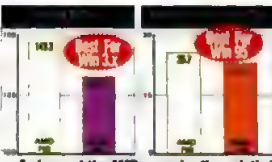
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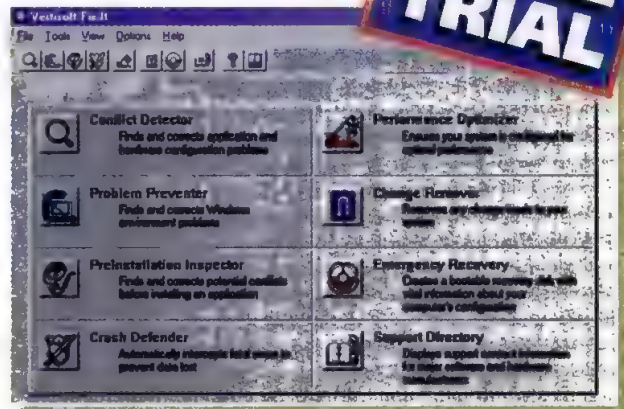
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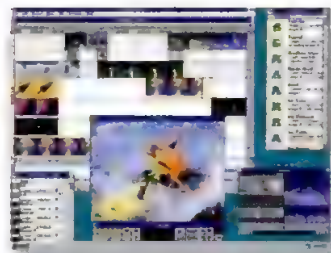
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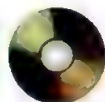
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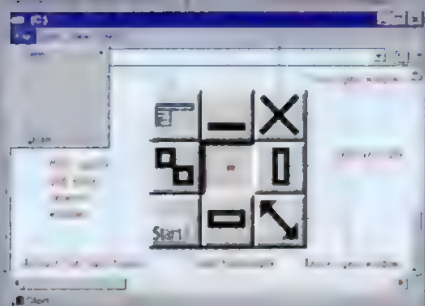
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TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

Circumventing Password Protection

Some Windows users like to secure their systems by password-protecting the screen saver and placing it in the StartUp group with /s on the command line. This can be a problem if you inherit such a computer and don't know the password, but there is a way around it. Reboot the system and press F5 to bypass the CONFIG.SYS and AUTOEXEC.BAT files. Now find the [Screen saver] section in your CONTROL.INI file and delete it or REMark it out (this is the encrypted password). Then scroll down to the [Screen saver.Name] section (where "Name" is the name of the screen saver being used) and either change PWProtected from 1 to 0 or delete the entire section. Save the file and reboot. Now the screen saver has no password. You can open the StartUp group window and remove the screen-saver icon, or leave it as is with no password.

BILL SACRAMONE,
Dudley, Massachusetts

PC MAGAZINE: Obviously, the protection gained by password-protecting a system this way is minimal. Still, it may prevent casual snooping. If you're interested in protecting your Windows 3.x system in this fashion, you need to take one step not mentioned in the description above. Before you can get Windows 3.x to launch a screen saver, you must convince Windows the screen saver is an executable file. Edit the programs= key in the [Windows] section of WIN.INI to include scr, like so:

```
programs=com exe bat pif scr
```

Now place a program item for the screen saver in the StartUp group, adding /s to the command line.

Windows 3.1 works with a wide variety of DOS versions, and many of those DOS versions do not support skipping CONFIG.SYS and AUTOEXEC.BAT processing by pressing F5 at start-up. If your version of DOS is one such, simply hold down the Shift key during Windows start-up. This will prevent the StartUp group programs from being loaded, thus permitting you to edit the .INI files.

Under Windows 95, dragging a shortcut to

your screen saver into the StartUp menu will cause the screen saver to be launched automatically at start-up. Windows 95 already recognizes that .SCR files are executable. To get into a Windows 95 system that's protected in this way, again simply hold down the Shift key while Windows 95 is starting. As in Windows 3.x, this prevents the automatic loading of the programs in the StartUp menu.

To disable the screen saver's password protection, you'll need to edit the Registry. Start the REGEDIT utility from the Run menu and navigate to the key

```
HKEY_CURRENT_USER\Control Panel\Desktop
```

You should see a value named Screen-SaveUsePassword in REGEDIT's right-hand panel. Double-click this value and change its data from 1 to 0. Now the screen saver is not password protected.

Merge .REG Files Silently

We do remote software installations across our network using an installation-control application. I wanted the software to be registered automatically in the Windows 3.1 Registration Database without displaying the message box that indicates the information was successfully merged. Because Microsoft's setup programs for Excel, WinWord, and so forth all have a /q switch for "quiet" mode, I tried that on a REGEDIT command line. It didn't work. Then I tried /s (for "silent")—and that one did work. The command

```
REGEDIT /S FILENAME.REG
```

merges the registration file without displaying the confirmation dialog box.

I couldn't find that switch anywhere, not even in the Windows 3.1 Resource Kit manual; it seems to be an undocumented function.

CHRISTOS PSARRAS,
Birmingham, Alabama

PC MAGAZINE: The /s switch works with Windows 95's REGEDIT utility as well. That's a great help, because the Windows 95 Registry is far more essential than the Windows 3.1

HIGHLIGHTS



HARDWARE Beware! Ignoring error messages can be literally devastating to your programs and valuable data. *Page 378*



WORD PROCESSING Why you should avoid naming a file CON.DOC and what you can do about it if you already have. *Page 388*



DATABASES Find out how to load data into combo and list boxes in Microsoft Access without (repeatedly) opening too many virtual tables. *Page 394*

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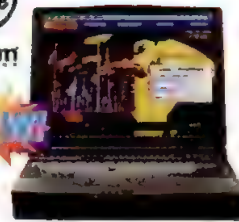
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```
REGEDIT /S FILENAME.REG
```

The only time you'll be confronted with a message box is when the .REG file is absent or invalid.

This switch isn't absolutely undocumented, but it's certainly well hidden! The only references I could turn up were buried in the documentation for Microsoft's Visual C++.

Experimenting with Start-Up Files

In the Solutions column of your issue of February 6, 1996, you offer advice about preventing breakout during boot-up. But the reader had stated that he was using DOS 5, and you presented tips for actions during boot-up that weren't introduced until DOS 6 (pressing F5 to skip processing start-up files during boot-up, for example).

Rather than changing the configuration on my hard disk and having a bootable floppy disk for emergencies, I've always preferred modifying AUTOEXEC.BAT and CONFIG.SYS on a bootable floppy disk. You still point to all the files on C: so that testing device drivers and such works. And if there's an errant program during start-up, you don't have to "recover" from your floppy disk—just take it out and reboot. Of course, having a clean bootable floppy disk is a good idea anytime, especially once you install the tested start-up files onto your hard disk.

JOHN F. LONG, via the Internet

PC MAGAZINE: The Solutions item mentioned here involved preventing users from breaking out of the boot process. It introduced a keyboard-disabling nonresident device driver, KDISABLE.SYS, and a keyboard-enabling program, KENABLE.COM. The programs themselves work fine under DOS 5. But as Mr. Long notes, the ancillary advice—on how to skip the processing of start-up files if something goes wrong—was specific to DOS 6 and later. Mea culpa!

An error in the start-up files can prevent the system from booting at all. The standard solution is to boot from a floppy disk, repair the error, and try again. But isolating experimental start-up files on a bootable floppy disk and leaving the hard disk files unchanged is an even better idea.

To prepare for this technique, copy your AUTOEXEC.BAT and CONFIG.SYS to a bootable floppy disk. Edit both to include the full pathname for all drivers and programs loaded. For example, change device=ansi.sys to device=c:\ansi.sys. Boot from this floppy disk and confirm that all drivers and programs have been loaded correctly. Now copy the modified files back to the hard disk before making any further changes.

Of course, you won't want to boot from a floppy disk forever. After you've modified your start-up files and confirmed that they work correctly, you'll want to copy them back to your hard disk. Even so, the system could fail to boot; for example, a device driver might become corrupted on the hard disk. Thus, it's still important to keep a bootable floppy disk on hand that contains the bare essentials in AUTOEXEC.BAT and CONFIG.SYS.

Keep Subdirectory Links Near Subdirectories

Shortcuts are a very useful feature of Windows 95. Because shortcuts are files, they always get sorted in with all the other files. This isn't a problem, unless the link is to a subdirectory instead of to a file. In those cases, I find that if I start the link name with a space instead of an alphanumeric character, the directory links will sort directly under the regular subdirectories, making the shortcuts much easier to find.

AREK PFEFFER, Wildomar, California

PC MAGAZINE: In Explorer's Details view, you can sort on name, size, type, or date/time by clicking the button at the top of the corresponding column. Clicking the same button twice reverses the sort order. But in each case, folders are sorted separately from files. If the list is sorted in ascending order, folders come first; if in descending order, they come last.

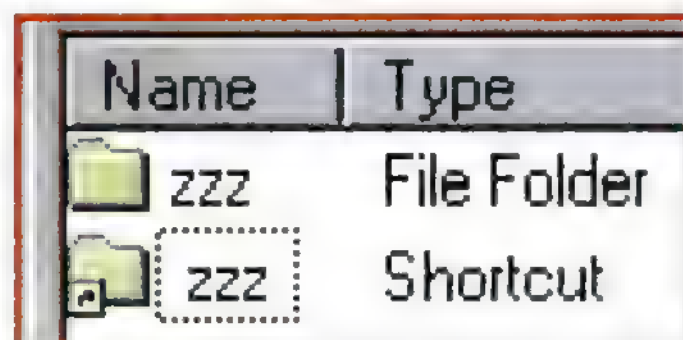


FIGURE 1: Changing a folder shortcut's name to start with a space makes it appear just after the actual folders when sorted by name.

A shortcut file that points to a folder looks almost the same as a folder in Explorer's listing. As Figure 1 shows, the shortcut's folder icon has a small boxed arrow in the lower-left corner. Thus, forcing folder shortcuts to come just after the actual folders makes the list look bet-

ter and makes folder shortcuts easier to find.

Interestingly enough, you can't use Explorer to add a space to the beginning of a filename. Explorer strips leading and trailing spaces from the name you enter, then complains that the new name is the same as the old. Instead, perform this task in a DOS box, putting quotes around the new name

```
RENAM OLD.LNK "_OLD.LNK"
```

where the underscore represents a space character.

Easy Access to Your Desktop Shortcuts

Have you ever found your Windows 95 desktop cluttered with dozens of windows that hinder your access to desktop shortcuts? Of course, you could duplicate all your shortcuts on the Start menu, but this is a waste of time and disk space. A better way to get to your desktop quickly is to create a shortcut to it on the Start menu, then assign it the shortcut key of Ctrl-Alt-D.

To do this, right-click on the Start button and select Open. Right-click in a blank area of the resulting window, and select New | Shortcut. In the Create Shortcut dialog box, type

```
C:\WINDOWS\EXPLORER.EXE /n, /root,
```

(don't forget the final comma) and click Next. Name the shortcut Desktop and click Finish.

To assign a shortcut key, right-click on the newly created shortcut, select Properties, and click the Shortcut tab. Click in the Shortcut Key box and press Ctrl-Alt-D. Click OK, and you're all set.

ADAM NOLLEY, Amherst, Virginia

PC MAGAZINE: Shortcuts on the desktop aren't very useful when they're hidden behind program windows. You can expose the entire desktop by right-clicking on the Taskbar and selecting Minimize All Windows. Mr. Nolley's tip, however, lets you reach shortcuts without disrupting the work you're doing.

You may want to omit the /n switch (and the comma that follows it) from the Explorer command line. This switch causes Explorer to open a new window even if there's an Explorer window to the same folder already open. When you activate the shortcut via its shortcut key, there's no problem, but choosing the Desktop item from the Start menu multiple times will launch multiple copies of Explorer. If you'd prefer to avoid this redundancy, change the shortcut command line to

```
C:\WINDOWS\EXPLORER.EXE /root,
```

Again, the comma following /root is essential.



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HARDWARE

Using Tape as a Disk



My computer system with a 1GB hard disk has a tape backup drive that I can access only through the Windows and DOS programs that came with it. Isn't there some way I can assign the tape drive a drive letter—such as E:—so I can access it as if it were a disk drive? Please tell me how to do this.

CHIRAG BHATT, Flushing, New York

PC MAGAZINE: There are tape drives and utility products that do what you seek; one such is TapeDisk (reviewed in First Looks, May 14, 1996), but there are some good reasons for not using tape as a disk drive.

Tape drives on personal computers are generally intended for use as backup devices, not to provide direct access to data on the tape. Tape drives are not well suited for storing files under DOS, because DOS uses a file allocation table (FAT) to track which clusters on the storage device contain the parts of different files. In order to read a file, the operating system has to keep going back to the FAT

to look up the location of the next cluster.

For a random-access device such as a magnetic hard disk, this system works pretty well; the read/write head can move rapidly from the innermost track to the outside track and back again.

But tape is not a random-access device, it's a serial-access device. To move from point A to point Z, you first need to traverse points B through Y. And to go from Z to A, you have to pass back through Y and all the other points between. Just as the serial-access Roman scrolls of ancient times gave way to the more random-access cut pages of a bound book, so have random-access storage devices replaced serial-access units.

Tape lingers because the cost per megabyte is extremely low and capacities are remarkably high; these advantages apply especially to DAT tape drives. End users, though, tend to be drawn to the "near-line" storage offered by devices that don't have the capacity of tape yet still offer substantial storage capacity on removable media. Magnetic media, such as SyQuest and Iomega drives, and optical read/write media, such as the magneto-optical and new phase-change technologies, provide

an attractive compromise between cost, capacity, and performance while still providing direct access to archived data.

So, if you want to access your backup data as if it were on a disk drive, consider replacing your tape drive with one of the new removable media drives instead.—*Alfred Poor*

Hard Disk Hang-Up

My computer often hangs while I'm running applications. Sometimes it pops up the warning, "A serious error has occurred while writing to Drive C. Continue will retry the operation." Sometimes the computer will recover from this, but most of the time I need to reboot to get running again. I have defragmented the disk, tried CHKDSK /F, changed the virtual memory from permanent to none to permanent again, but all to no avail. The hard disk has 70MB of available space. Do you have any suggestions?

FRED HYMAN,
Morristown, New Jersey

PC MAGAZINE: This does not sound good. One likely cause of this error is one or more bad sectors on your hard disk. If this is an older system, it is quite possible that you need to reformat the format of the disk.

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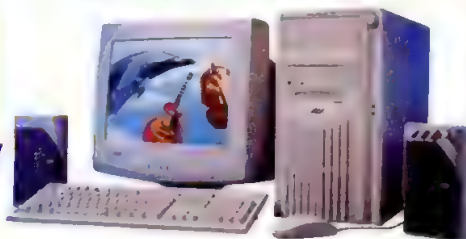
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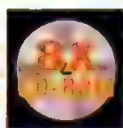
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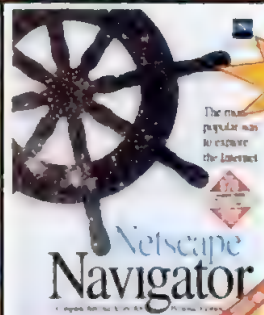
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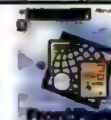
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Pentium 100	10.4" Active	8/810MB	2199
Pentium 100	11.3" Dual Scan SVGA	8/810MB	2479*
Pentium 100	11.3" Dual Scan SVGA	8/810MB	2899*†
Pentium 120	11.3" Dual Scan SVGA	16MB/1.1GB	2999*
Pentium 120	11.8" Active SVGA	16/810MB	3699*
Pentium 133	11.8" Active SVGA	16MB/1.1GB	4399*

* Features built-in audio
† Includes 4X CD-ROM drive

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Pentium 75	11.3" Dual Scan	8/810MB	3210
Pentium 75	10.4" Active	8/810MB	3399
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Pentium 100	11.3" Dual Scan SVGA	8/810MB	2849
Pentium 120	11.3" Active SVGA	16MB/1.35GB	4349
Pentium 120	10.4" Active SVGA	16/810MB	3599
Pentium 133	12.1" Active SVGA	16MB/1.35GB	4749
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Pentium 100	11.3" Dual Scan SVGA	8/810MB	2299*
Pentium 100	11.3" Active SVGA	8/810MB	2399
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* Features Windows for Workgroups

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Pentium 120	11.8" Active SVGA	16MB/1GB	4499*
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Pentium 120	11.3" Dual Scan SVGA	8MB/1GB	2269*
Pentium 120	11.3" Active SVGA	8MB/1GB	2779
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Pentium 133	11.3" Active SVGA	16MB/1.35GB	4699†
Pentium 150	11.3" Active SVGA	16MB/1.44GB	4799
Pentium 150	11.3" Active SVGA	16MB/1.44GB	4799*
Pentium 150	11.3" Active SVGA	16MB/1.44GB	4999†



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Pentium 100	11.3" Dual Scan SVGA	8MB/1GB	2499†

Processor	Screen	RAM/HD	Price
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Pentium 120	11.3" Dual Scan	8MB/1GB	3599*
Pentium 120	12.1" Dual Scan	16MB/1.1GB	2999†
Pentium 133	11.3" Active SVGA	16MB/1GB	3999†
Pentium 133	12.1" Active SVGA (SHA)	16MB/1GB	4899*
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Pentium 120	12.1" Active SVGA	16MB/1.35GB	5259
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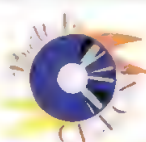
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Pentium 100	10.4" Active SVGA	8MB/1.3GB	2799
Pentium 120	11.3" Active SVGA	8MB/1.3GB	3599
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If you're running DOS 6.22 or Windows 95, start by running ScanDisk. ScanDisk will scan the disk surface and should locate any bad sectors. If there are a lot of them, you may want to consider reformatting your disk and restoring all your data from a backup.

One important warning: If ScanDisk locates a bad sector that contains data, it will find an available sector and use it as a replacement in that file, but it will fill the sector with zeros because it is unable to read the data from the damaged sector. This can mean a loss of data from data files, or the corruption of a program file that you will then have to restore from the original disks or a backup.

There are some products—such as SpinRite (Gibson Research, 800-736-0637)—that are able to resolve these problems in a more sophisticated manner. For example, SpinRite is often able to reformat the disk while leaving the data intact. (Just because this is *supposed* to work doesn't mean that you shouldn't back up everything *before* you start; Murphy is always lurking, waiting to apply his laws to your data!) If SpinRite finds a damaged cluster, it has some technical tricks it applies to try and recover the "lost" data, so the rebuilt file won't have any holes in it.

These errors may also signal impending hard disk failure. Now would be a good time to make certain all your essential files are backed up. Then make further backups as you work, until you either resolve the problem or replace the drive. In any event, this is not a problem to ignore, since it's not likely to go away by itself. If it does go away, it might well take your programs and data with it.—*Alfred Poor*

OPERATING ENVIRONMENTS

Win32 Under OS/2

 Whenever I try to run a Win32 program under Win-OS/2, I get a message that the system can't find a VMPCD driver file. What do I have to do to get Win32 programs to work?

MARK SMITH, Toledo, Ohio

PC MAGAZINE: This is just one of the many potential symptoms you might see when trying to run 32-bit Windows programs under OS/2 Warp. One of IBM's biggest challenges with OS/2 has been improving its own operating system while simultaneously trying to keep pace as Microsoft continues to update the programmer's interface for Windows. The WIN32s specification from Microsoft defines an interface for 32-bit programs to run under Windows. OS/2 Warp comes with support for programs written to Version 1.15 of the WIN32s specification. The problem is that Microsoft has continued to upgrade that interface, so many newer 32-bit Windows programs won't run on Warp.

You can greatly increase the number of Windows programs that will run on Warp by upgrading the virtual device driver that OS/2 uses to simulate the 32-bit Windows interface, vw32s.sys. A patch is available that will upgrade this to WIN32s, level 1.25. You can find the upgrade in the patches/drivers section of the OS/2 libraries on America Online, or in the PSPBETA Forum, Section 12, on CompuServe.

Two cautions: The OS/2 driver is still considered beta software, although many people have been using it successfully since it became available last October. Second, some Windows applications still won't run, even with Version 1.25, and Microsoft's WIN32s specification has now advanced to level 1.30. IBM executive John Soyring recently stated that Merlin, the new version of OS/2 on the horizon, will ship with Version 1.25, not 1.30, so the problem will continue for the foreseeable future.—*Brian Proffitt*

Dual-Boot Windows NT And Windows 95

My new computer came with Windows NT preinstalled. Is there a way to install Windows 95 as well, so that I can choose which operating system to boot from when I start the machine? Do I have to worry about using NTFS versus FAT?

OMAR M. ELKHAYAT, via ZD Net

PC MAGAZINE: Any drives formatted for NTFS will be completely inaccessible to Windows 95. But if your boot drive still uses the FAT file system, you can add dual-booting between Windows NT 3.5x and Windows 95. The first step is to create an Emergency Repair Disk, if you don't already have one, by running the RDISK utility in the Windows NT system directory. Now restart the system and boot into DOS. From DOS, install Windows 95. When you restart the system, choosing DOS from the NT Flex Boot menu will run Windows 95. If you retained your old DOS when installing Windows 95, you can reach it by pressing F4 when the "Starting Windows 95" message appears on your screen.

If the system won't boot, boot from the Windows NT setup disk and press R (for Repair) when the setup options appear. The only repair option you need is Inspect Boot Sector; clear the other options. Follow the prompts, inserting the Emergency Repair Disk when requested, and your system should be restored to working order.

Of course, your Flex Boot menu is wrong now. When you choose DOS, you get Windows 95. You can correct this with any text editor. Load the BOOT.INI file

(found in the root directory of the boot drive) and find the section titled [operating systems]. Find the key that represents the DOS menu entry, and change it to reference Windows 95. That's it!—*Neil J. Rubenking*

Problems with ScanDisk

Whenever I run ScanDisk under Windows 95, if ScanDisk finds corrupted files it prompts me for the action to take (usually convert the information into files or just delete it). The program then restarts itself—anywhere from three to five times—before it actually completes the action. Is there a problem with the program?

BRIAN WOZNAK, via the Internet

PC MAGAZINE: There's no problem with ScanDisk. If there is any disk activity between the time ScanDisk reports an error and the time you respond to its report, the program may rescan the disk and require your response again. To avoid this tedious interaction, start by checking the Automatically fix errors box on ScanDisk's main screen. Now it will fix all the errors it finds without input from you.

Because you won't be there to pass judgment, however, you need to set ScanDisk's most cautious error-handling options. Press the Advanced button to bring up the Advanced Options dialog. Check the Never radio button in the Display summary panel, the Append to log radio button in the Log file panel, the Make copies radio button in the Cross-linked files panel, and the Convert to files radio button in the Lost file fragments panel. Check all three check boxes as well; the result will look like Figure 1. Now press OK.

From now on, ScanDisk will fix errors quietly and automatically, keeping a running log of its activity in C:\Scandisk.log. You need to check the log file every week or so and deal with any specific problems reported. Check

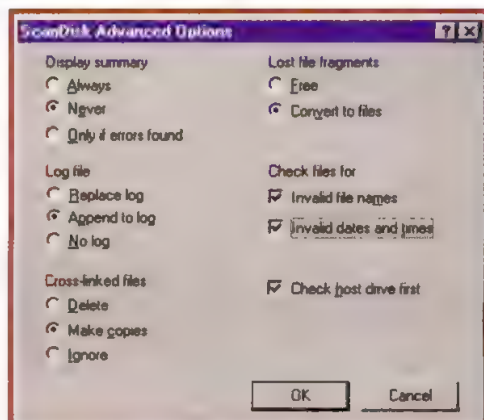


FIGURE 1: If you set ScanDisk to fix errors automatically, you need to choose the most cautious error-handling options.

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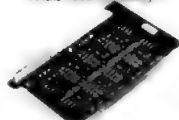
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Satellite Pro 420CDS, 420COT	362
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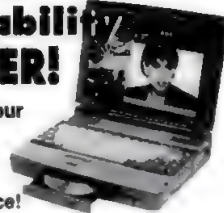
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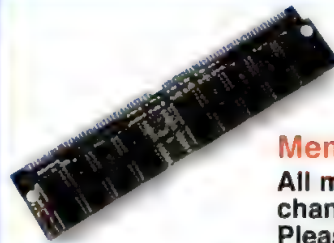
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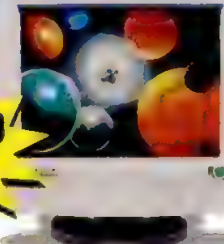
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any files that were created from lost file fragments and either rename or delete them. Examine the copies of cross-linked files. Usually one or both of these files will be damaged; investigate the damage. Delete the rather verbose log file after you've dealt with any problems.—Neil J. Rubenking

Cut-And-Paste Problem

Whenever I try to cut and paste a large text file in Windows 95, it doesn't work. I think this is because whatever program my computer uses to temporarily store the information is incapable of holding that much information. Can you recommend a different program, or give me ideas as to how I can cut and paste larger files? Also, if I do use a new program, how do I let my computer know to use the new program and not the old one?

BRIAN WOZNAK, via Internet

PC MAGAZINE: Cut-and-paste is an essential part of Windows, and there's no separate program to handle it. Don't be confused by the Clipboard Viewer accessory—all it does is display the contents of the Windows clipboard. The only normal reason for cut-and-paste failure is insufficient memory. Even if your system is short of physical RAM, Windows 95 will normally create disk-based virtual memory as needed by enlarging the swap file. However, it can be foiled by lack of disk space on the drive that holds the swap file, or by a user-imposed limit on the size of the swap file.

What can you do instead? That depends on what you are trying to accomplish. If you simply want to edit a new copy of the large file while retaining the existing file, you can make the copy using Explorer or a DOS box and then edit the copy. If your purpose is to move the file into a different program, you can probably get the desired effect by saving the file as plain text and then reading it into the target program. And if you really, desperately need to copy that text via the clipboard, you can do it in small chunks rather than all at once. In any case, if your system has less than 16MB of RAM, consider bringing it up to 16MB.—Neil J. Rubenking

WORD PROCESSING

Deleting a File That Won't Delete



After saving a file named CON.DOC in Microsoft Word, I found the file was giving my system fits. PKZIP, for example, would halt until I hit Ctrl-Break to stop the program. Much the same happened when I tried to copy CON.DOC from the DOS prompt.

Trying to delete the file from the DOS prompt with the DEL command was similarly unsuccessful but more informative, returning the message "Access denied." I then tried looking at the file's attributes with the command ATTRIB CON.DOC. All that did was return the message "File not found."

There doesn't seem to be any way of actually deleting the file, short of reformatting my hard disk. Do you have any suggestions?

DAVID CRENSHAW, via CompuServe

PC MAGAZINE: Chances are good you did not actually create a CON.DOC file. It should be impossible for any program (except a low-level disk utility) to create a file whose filename portion is CON (or any other reserved DOS device name). The standard reserved device names are CON, AUX, PRN, CLOCK\$, COM1 through COM4, LPT1 through LPT4, and CONFIG\$. In addition, your system will almost certainly have other named devices installed in CONFIG.SYS.

Still, many DOS commands (COPY, for example) will treat the filename CON.DOC as a reference to the CON device. The command will not return a "File not found" error, but it may seem to hang the system. In fact, the system isn't hung, it's simply waiting for input from the CON device. This behavior often convinces users that such a file does exist.

It is conceivable that you did somehow manage to create a file named CON.DOC. In that case, deleting the file is easy. First, confirm that the file actually exists by entering the command DIR CON*.DOC (the wildcard is essential). To delete the file, first move any other files that match the filespec C*.DOC to another directory. Then, from the DOS prompt, give the command DEL C*.DOC. This will delete any files with the .DOC extension that start with C, including CON.DOC.

The reason this filename creates a problem is that DOS confuses it with CON:, the DOS console. In fact, if you have a CON.DOC on your disk, and you give the DOS command COPY CON.DOC NEW.DOC, DOS will not copy the file called CON.DOC to the file NEW.DOC. Instead, it will treat the command as if you typed COPY CON NEW.DOC.

At this point, DOS is waiting for you to enter some text from the keyboard (which is the console, or CON), terminated by a Ctrl-Z. If you don't know this, you may think the system has locked up. If this happens to you, simply press Ctrl-Z and then discard NEW.DOC.

Mr. Crenshaw should not have been able to save a file as CON.DOC using Word; it's possible he was fooled by DOS's behavior into thinking the file had been created. I certainly could not create it using Word 6.0 and DOS 6.22. Any attempt to save a file under that name returned the message that Word cannot complete the save due to a file permission error. Word 7.0 accurately reports that "The

filename 'con.doc' is a reserved device name." I was able to get around this only by saving the file as AON.DOC, deleting it, then using the DOS Undelete command to undelete the file, and specifying the letter C as the first letter for the undeleted file.

Assuming you have managed to get around the normal barriers to creating a file whose name portion matches a reserved device name, deleting the file isn't the only problem you may run into. The more serious issue is that you'll be unable to open the file. In my tests, when I chose File | Open in Word and selected the file CON.DOC, Word responded that the file could not be found. Other programs, whether in DOS or Windows, may give the same result, or they may crash.

The solution to regain access to the file—and the information in it—is the mirror image to my approach to creating it in the first place. First delete it with the command DEL C*.DOC, then undelete it, giving it a different first letter. You should then have no problem opening it. Be sure to note, however, that the Undelete command cannot be used in conjunction with 32-bit disk/file access under Windows 3.x, or under Windows 95.

—M. David Stone

SPREADSHEETS

Leaping over 1900 in Excel 5.0



In developing a calendar object for a number of projects, we discovered an error in Microsoft Excel 5.0. We had decided to standardize our calendar object to begin on January 1, 1900, as Excel does. We found, however, that the days of the week for our calendar were one day off from the correct calendar. After some analysis, we discovered that Excel erroneously reports that 1900 was a leap year, and it accepts February 29, 1900 as a valid date.

1900 was not a leap year. Leap years occur in years exactly divisible by four, except that the years ending in 00 (the century years) must be divisible by 400 to be leap years. In other words, 1600 was a leap year and 2000 will be a leap year, but 1700, 1800, and 1900 were not. Evidently Excel doesn't know this—and we thought your readers should beware.

J. SCHECHTER and S. TAJ, via ZD Net

PC MAGAZINE: Actually, this date error originated with the first version of Lotus 1-2-3, back in the early 1980s. Excel's first version, written for the Macintosh with little or no concern for Lotus compatibility, sidestepped the issue by using 1904 as its base year. In developing its initial Windows version of Excel, however, Microsoft found itself in an awkward position. Excel for Windows had to be

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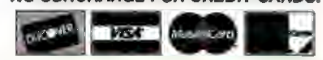
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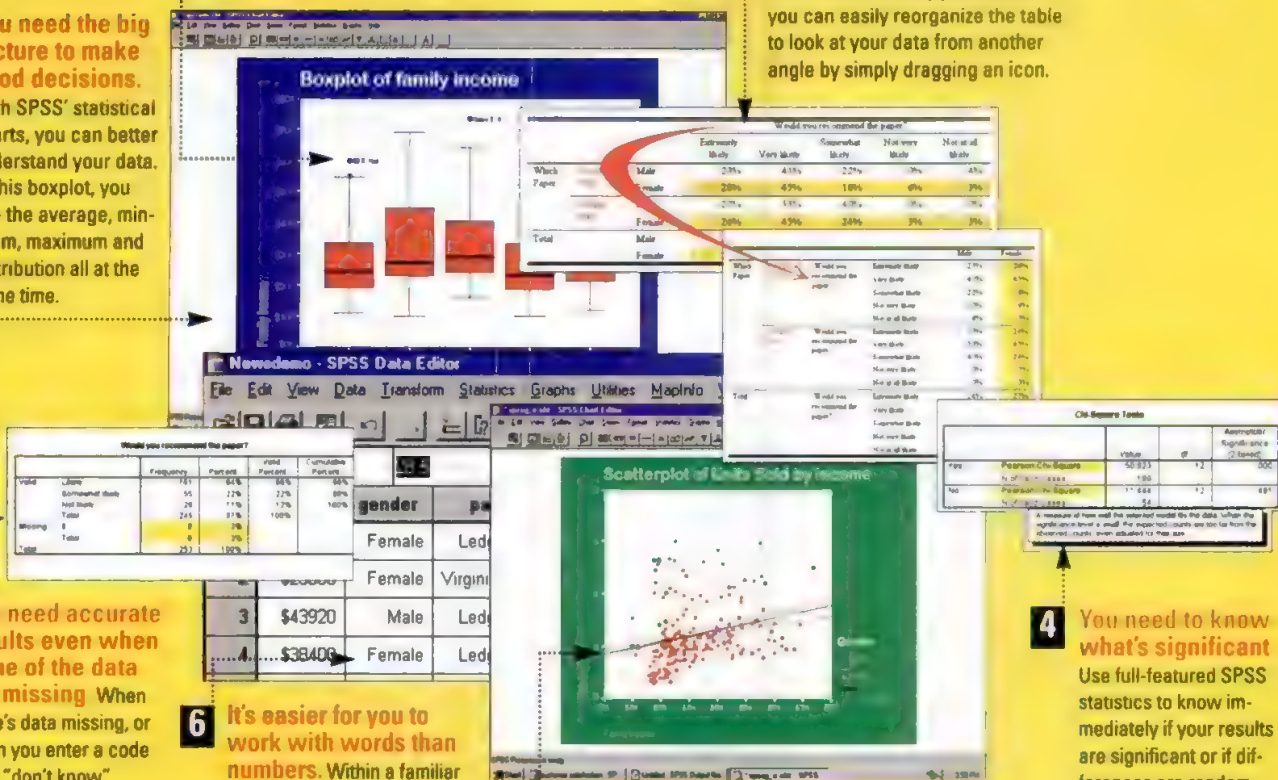
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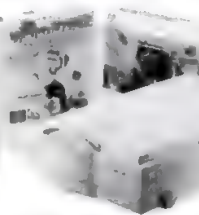
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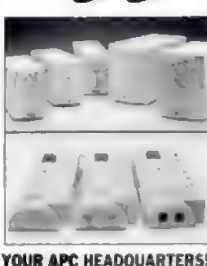
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compatible with both 1-2-3 and Excel for the Macintosh.

Microsoft chose to be like 1-2-3—that is, to use a base date of December 31, 1899, and pretend that 1900 was a leap year. Thus, in Excel, as in 1-2-3, January 1, 1900, has the serial date value 1, and the bogus February 29, 1900, has the serial date value 60. The Excel for Windows version also included a “1904 Date System” option that allowed users to switch to the Macintosh’s base date, thereby facilitating the exchange of .XLS files between the two operating systems. Ordinarily, however, there’s no need to use that option. Excel automatically converts from one base date to the other when you import a Mac worksheet into Windows or vice versa.

Meanwhile, the other major spreadsheet of the late 1980s, Quattro Pro, took a different tack. Eager to be compatible with both the calendar and 1-2-3, Quattro Pro’s designers moved the base date back to December 30, 1899, while disallowing February 29, 1900. As a result, Quattro Pro’s date values for the first two months of the century differ from those of Excel and 1-2-3. January 1, 1900, for example, has the date value 2 in Quattro Pro but 1 in Excel and 1-2-3. From March 1, 1900, on, however, the three programs are in agreement.

So what’s an Excel or 1-2-3 user to do? If you must work with dates in the first two months of 1900, it might be a good idea to switch to Quattro Pro. For what it may be worth, Quattro Pro is also at least semi-intelligent about dates prior to 1900. For example, if you ask for

@DATEVALUE("11/16/1850")

Quattro Pro returns -17941, meaning that November 16, 1850, was 17,941 days prior to the program’s base date. (The same formula in Excel and 1-2-3 returns an error value.) Apply a date format to the cell, and you’ll see a genuine nineteenth-century date. Unfortunately, Quattro Pro’s @DATE function isn’t equipped to handle nineteenth-century arguments!

For the vast majority of us, focused as we are on the very near past, the present, and the future, the Excel/1-2-3 leap-year mix-up is nothing to worry about. All of the dates except for that nonexistent February 29 come out correctly.—Craig Stinson

DATABASES

Loading Combo and List Boxes in Access



I needed to do two things: get around the limit to the number of open virtual tables, and increase the loading speed of a complex form. So I came up with a function that does both. Normally each list box or

combo box that uses a table or query for its row source uses up one or more virtual tables when the form is run. My function reduces this number by preloading the data from a table or query into a list box or combo box. First it reads the data from the table or query into a variable, then it closes the table or query, and finally, it sets the row source of each list box or combo box to the variable.

Because the data is preloaded through a variable, the table or query does not have to be opened when Access processes the form’s controls. As a result, the number of virtual tables required during form processing is reduced. This is particularly useful when you have several list boxes or combo boxes that reference the same table or query, because then the performance benefit is multiplied.

The performance savings comes from Access not having to open the same table repeatedly to fill the list boxes or combo boxes. Using my method, the table is opened only once. This is much faster than Access’s built-in method for filling a list box from code. The one limitation is that the RowSource property cannot exceed 2,048 characters.

The Fillboxes function shown in Figure 2 can be called from the On Open event or any other valid event. The function was tested using Access 2.0.

WAYNE VINCENT,
Framingham, Massachusetts

PC MAGAZINE: Many database applications load a list or combo box with the contents of a lookup table for the user’s convenience. Access provides a number of ways to load a list or combo box. For example, you can type the list of items directly into the RowSource property when you create the control. In this case, the list is called a value list and is limited to 2,048 characters, the maximum width of the RowSource property. Or, you can supply the name of a table or query or enter a SQL SELECT statement, in which case Access populates the control at runtime with the results of a query or table data. In this case the 2,048-character limitation goes away, but Access must, of course, open and close the required tables to get the information for each control.

If you’re using the same table or query for several controls and the table or query is relatively small, you can save time by programmatically constructing a value list. This requires reading the required information into

```
*****
' FillBoxes() - Fill List and Combo boxes on a
' Form with Table Data
*****
Function FillBoxes ()
Dim MyDB As Database, Testdata As Recordset
Dim strSrc As String

Set MyDB = dbengine.workspaces(0).databases(0)
Set Testdata = MyDB.OpenRecordset("Categories",
    >DB_OPEN_DYNASET)
Do Until Testdata.EOF
    strSrc = strSrc & Testdata!Name & ";"
    >& Testdata!ID & ";"
    Testdata.MoveNext
Loop
Testdata.Close

[Forms]![Formname]![Combo0].RowSource = strSrc
[Forms]![Formname]![Combo1].RowSource = strSrc
[Forms]![Formname]![List0].RowSource = strSrc
[Forms]![Formname]![List1].RowSource = strSrc
End Function
```

FIGURE 2: You can populate a list box or combo box control by creating a value list with the appropriate values separated by semicolons. If you use the same table or query as the basis for several controls, you can avoid having to open the table many times by creating the value list once and assigning it to each control’s RowSource property.

a string variable, and then assigning that result to the RowSource property of each control. You save time by opening tables once rather than having Access open and close the same tables many times.

The information stored in the string variable must be in proper value list row source format, semicolon delimited in this fashion:

Item1;item2;item3;...:ItemN;

Items are pulled into the control from left to right, so a properly constructed value list for a two-column combo box of state names and abbreviations looks like this:

Alaska;AK;Alabama;AL;Arkansas;AR;
➤Arizona;AZ

Once you’ve created the value-list string programmatically, it can then be assigned to the RowSource property of the appropriate control. You’ll have to be certain that the rows and columns combined to populate the string fit within that 2,048-character limitation, however.

Because the basic requirement is to build a properly constructed value-list string from a table, I generalized this logic into the two functions shown in Figure 3. The purpose of these functions is to build a value-list string using the contents of the table whose name you supply to the function. The first function, Tbl2Str, assumes that the table you specify is

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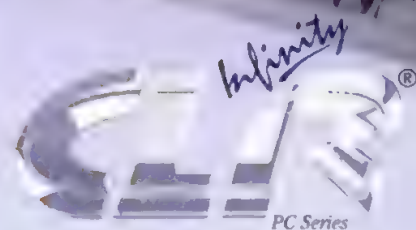
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```
*****
' Function Tbl2Str (strTbl As String)
' Microsoft Access 2.0
'
' This function creates a rowsource string
' (value list) from the contents of a table.
' You pass it the name of a table in the
' currently open database. It assumes the
' first two columns in the table are a
' primary-key ID column and a text column.
' The returned string can be used as the
' rowsource for a two-column combo box or
' list box: first column text, second column ID.

*****
Function Tbl2Str (strTbl As String)
Dim MyDB As Database      ' Database, assumed open
Dim tblRead As Recordset  ' To hold recordset
Dim strSrc As String      ' To hold row source string

Set MyDB = dbengine.workspaces(0).databases(0)
Set tblRead = MyDB.OpenRecordset(strTbl, DB_OPEN_TABLE)
Do Until tblRead.EOF
    strSrc = strSrc & tblRead.Fields(1) & ";"
    => & tblRead.Fields(0) & ";"
    tblRead.MoveNext
Loop

tblRead.Close
Tbl2str = strSrc
End Function
*****
' Function Tbl2Str2 (strTbl As String,
' Microsoft Access 2
```

```
strCol1 As String, strCol2 As String))
'
' This function creates a rowsource string
' (value list) from the contents of a table.
' You pass it the name of the table or query
' and the names of two columns to use
' to populate the rowsource string. It assumes
' the first column is a primary-key ID
' column and the second column a text column
' containing the values by which to sort.
' The returned string can be used as the
' rowsource for a two-column combo box or
' list box: first column text, second column ID.

*****
Function Tbl2Str2 (strTbl As String, strCol1 As String,
    strCol2 As String)
Dim MyDB As Database      ' Database, assumed open
Dim tblRead As Recordset  ' To hold recordset
Dim strSrc As String      ' To hold row source string

Set MyDB = dbengine.workspaces(0).databases(0)
Set tblRead = MyDB.OpenRecordset("SELECT [" & strCol1 &
    & "], [" & strCol2 & "] FROM [" & strTbl & "]
    ORDER BY [" & strCol2 & "]", DB_OPEN_DYNASET)

Do Until tblRead.EOF
    strSrc = strSrc & tblRead.Fields(1) & ";"
    => & tblRead.Fields(0) & ";"
    tblRead.MoveNext
Loop

tblRead.Close
Tbl2Str2 = strSrc
End Function
```



FIGURE 3: You can use either the *Tbl2Str* or the *Tbl2Str2* functions to create a value list from the contents of a table. The string can then be assigned to the *RowSource* property of a list or combo box, provided the string is fewer than 2,048 characters long.

like most lookup tables, a two-column table with a primary key in the first column and a text string in the second. In the Northwind sample database that comes with Access, the *Categories* table is a good example of such a table.

The function opens a *Recordset* object called *TblRead* for the specified table, and then uses the *Fields* collection to obtain the first two columns. *Fields(0)* is the first column, assumed to be the primary-key column, and *Fields(1)* is the second column, assumed to be the text. Of course this function is not for you if your table is not arranged like this, with the expected columns in the expected order. Note, too, that replication in Access 95 changes the number of columns and their order in each of the tables, so this function should not be used on a database that may one day become replicated. Both of these functions work in either Access 2.0 or Access 95.

The second function, *Tbl2Str2*, lets you specify the names of the two columns to use for the list/combo box as well as the table

name; in the process it removes any requirement as to column order in the table. The resulting list is sorted by the values in the second column. *Tbl2Str2* builds a SQL *SELECT* statement to populate the *Recordset* with the requested rows, which it then uses to construct the value-list string. Note that the first-named column is assumed to be the primary key and the second the text.

Let's assume you have a form with three combo boxes that need to be populated with the contents of the *Products* table. You might place code like the following in the form's "On Open" event:

```
Dim strSrc As String
strSrc = tbl2str2("Products",
    => "ProductId", "ProductName")
Me![Combo0].RowSource = strSrc
Me![Combo1].RowSource = strSrc
Me![Combo2].RowSource = strSrc
```

The *Tbl2Str* and *Tbl2Str2* functions can be downloaded from PC Magazine Online. Look for the file *TBL2STR.AB*. See the sidebar

"Guide to Our Utilities" in this issue's Utilities column for downloading instructions.
—Sal Ricciardi

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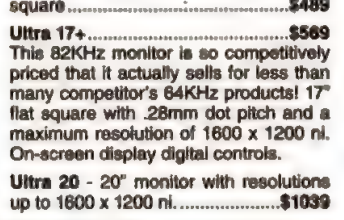
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NEC	MultiSync 400 7.5" Disk Changer (External) \$349	CREATIVE LABS	Master CD-RX Pro \$349	PLEXTOR	PE-4500 4X CD-ROM \$319
MultiSync 400 7.5" Disk Changer (External) \$349	MultiSync 400 7.5" Disk Changer (External) \$349	Master CD-RX Pro \$349	Master CD-RX Pro \$349	PE-4500 4X CD-ROM \$319	PE-4500 4X CD-ROM \$319
MultiSync 400 7.5" Disk Changer (External) \$349	MultiSync 400 7.5" Disk Changer (External) \$349	Master CD-RX Pro \$349	Master CD-RX Pro \$349	PE-4500 4X CD-ROM \$319	PE-4500 4X CD-ROM \$319
MultiSync 400 7.5" Disk Changer (External) \$349	MultiSync 400 7.5" Disk Changer (External) \$349	Master CD-RX Pro \$349	Master CD-RX Pro \$349	PE-4500 4X CD-ROM \$319	PE-4500 4X CD-ROM \$319

Desktops Systems

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Panasonic KXL-720 2X Portable CD-ROM Drive, Factory-Refurbished, 2 Year Factory Warranty \$129

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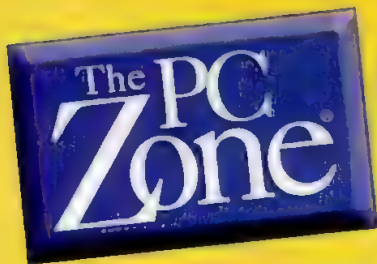
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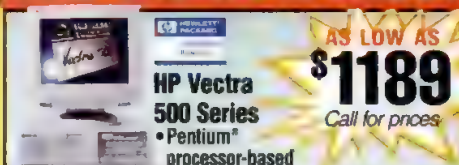
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36554 Aptiva 233 P133 16MB 11GB 8X CD MT	\$2,449.00
36555 Aptiva 233 P133 16MB 11GB 8X CD MT	\$2,499.00
36555 Aptiva 233 P133 16MB 11GB 8X CD MT	\$2,499.00
36555 Aptiva 233 P133 16MB 11GB 8X CD MT	\$2,499.00
Packard Bell Platinum	
34184 Platinum 40 P133 16MB 11GB 8X CD MT	\$1,799.00
34185 Platinum 60 P166 16MB 11GB 8X CD MT	\$2,199.00
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33177 P100 8MB 810HD 12.1" SVGA TFT W95	\$3,749.00
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Texas Instruments	
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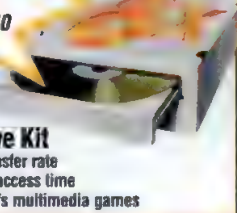
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NEC	4X	CDR222	200ms	\$99	\$189
Plextor	4.5X	PX43CE	130ms	\$230	\$320
Teac	6X	CD56S	160ms	\$155	\$245
Plextor	6X	PX63CS	145ms	\$269	\$359
Philips	8X	PC80S	195ms	\$225	\$315
NEC	8X	CDR1410	145ms	\$219	\$309
Plextor	8X	PX83CS	115ms	\$339	\$429

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Brand	Spin	Model	Speed	Int	Ext
OEM	4X	IDECD4X	200ms	\$65	\$80
NEC	6X	CDR1300	145ms	\$79	\$94
Acer	8X	ACB85A	190ms	\$99	\$114
Sony	8X	CDU311	160ms	\$115	\$130
Mitsumi	8X	CRMCFX800	150ms	\$120	\$135
Teac	8X	CD58E	110ms	\$115	\$130
Toshiba	8X	XMS602B	145ms	\$115	\$130
NEC	8X	CDR1400	140ms	\$150	\$165
Pioneer	10X	DRA10X	140ms	\$199	\$214
Pinnacle	10X	IDECD10X	130ms	\$239	\$254

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Brand	Spin	Model	Speed	Int	Ext
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NEC	4X	CDR4X4	4Disk	250ms	\$159

Internal IDE

Brand	Spin	Model	Speed	Int	Ext
Nakamichi	8X	MJ48S	4Disk	150ms	\$549

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Brand	Spin	Model	Speed	Int	Ext
Pioneer	4.4X	DRM-624X	6 Disk	190ms	\$359

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Capacity Brand & Model Price

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8mm DAT DRIVES

3.5-7GB	Exabyte EXB8205XL	\$1269
7-14GB	Exabyte EXB8505XL	\$1889
7-14GB	Exabyte EXB8700LT	\$1149
20-40GB	Exabyte EXB8900	\$5499
70-140GB	Exabyte EXB10H 10 tape autoloader	\$5439

DLT DRIVES

15-30GB	Quantum DLT2000	\$2899
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QIC

800MB	\$141
1GB	\$159
1.7GB	\$219
3.2GB	\$249
4.4GB	\$259
External for Printer Port	
800MB	\$259
1Gig	\$269
Internal IDE	
2-4Gig	\$319
4-8Gig	\$399



Price includes Windows backup software and 1 Free Tape.

Bundle Special!
Buy any tape drive with any hard drive and take \$10 off the total price.

IDE HARD DRIVES

IDE	Speed	RPM	Brand	Model	Wty	Price
540MB	14ms	3600	Seagate	ST3541A	3	\$151
540MB	14ms	4480	Maxtor	M7541A	3	\$159
639MB	10ms	4500	Western Digital	AC2635	3	\$166
850MB	10ms	4500	Western Digital	AC2850	3	\$165
850MB	14ms	3600	Seagate	ST3851A	3	\$171
1080MB	11ms	4500	Fujitsu	M1614T	3	\$165
1084MB	14ms	4480	Maxtor	M71084A	2	\$185
1250MB	15ms	3600	Quantum	BF1250A	3	\$175
1270MB	10.5ms	5400	Seagate	ST51270A	3	\$187
1280MB	12ms	5400	Quantum	FB1280A	3	\$198
1281MB	11ms	5200	Western Digital	AC21200A	3	\$192
1336MB	11ms	4480	Maxtor	M71336A	3	\$190
1620MB	14ms	3600	Seagate	ST31621A	3	\$212
1624MB	10ms	5200	Western Digital	AC31600	3	\$225
1625MB	10.5ms	5400	Seagate	ST31640A	3	\$228
1626MB	11ms	4480	Maxtor	M71626AP	3	\$220
1700MB	11ms	4500	Quantum	SR31700A	3	\$218
2004MB	11ms	4480	Maxtor	M72004A	3	\$265
2100MB	11ms	5200	Western Digital	AC32100	3	\$285
2167MB	10.5ms	5400	Seagate	ST32140A	3	\$262
2168MB	10.5ms	4500	Quantum	TM32160A	3	\$270
2500MB	9ms	5400	Fujitsu	M1638T	3	\$295
2550MB	15ms	3600	Quantum	BF2500A	3	\$259
2550MB	11ms	4500	Quantum	SR32550A	3	\$299
2559MB	11ms	5200	Western Digital	AC32500	3	\$319
3166MB	12ms	5200	Western Digital	AC33100	3	\$409
3254MB	10.5ms	4500	Quantum	TM33200A	3	\$345
4250MB	10.5ms	5400	Seagate	ST34250A	3	\$Call
2 1/2"						
540MB	13ms	4200	Toshiba	MK1924FC	1	\$229
810MB	13ms	4200	Toshiba	MK1926FC	1	\$329
1350MB	13ms	4200	Toshiba	MK2720FC	1	\$519
2100MB	13ms	4200	Toshiba	MK2101MAN	1	\$699

SCSI HARD DRIVES

SCSI	Speed	RPM	Brand	Model	Wty	Int	Ext
1050MB	9ms	5400	Seagate	ST31055N	3	\$339	\$399
1080MB	12.5ms	5400	Seagate	ST31080N	3	\$259	\$319
2147MB	9ms	5400	Seagate	ST32155N	5	\$499	\$559
2147MB	8ms	7200	Seagate	ST32550N	5	\$729	\$789
2150MB	8.5ms	7200	Quantum	XP32150	5	\$639	\$699
4290MB	8ms	7200	Seagate	ST35230N	5	\$889	\$949
4290MB	8ms	7200	Seagate	ST35150N	5	\$969	\$1019
4300MB	8.6ms	7200	Quantum	XP34300	5	\$900	\$960
9080MB	11ms	5400	Seagate	ST410800N	5	\$1749	\$1849

WIDE SCSI

1070MB	8ms	7200	Quantum	XP31070W	5	\$299	\$429
2147MB	8ms	7200	Seagate	ST32550W	5	\$789	\$919
2150MB	9ms	5400	Seagate	ST32155W	5	\$559	\$689
2150MB	8.5ms	7200	Quantum	XP32150W	5	\$649	\$779
4294MB	8ms	7200	Seagate	ST35150W	5	\$1029	\$1139
4300MB	8.6ms	7200	Quantum	XP34300W	5	\$919	\$1049
9100MB	11ms	5400	Seagate	ST410800W	5	\$2029	\$2239

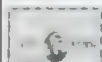
WIDE DIFFERENTIAL SCSI

4290MB	8ms	7200	Seagate	ST35150WD	5	\$1279	\$1409
4294MB	8ms	7200	Micropolis	MC3243WD	5	\$899	\$1019
9091MB	8.5ms	7200	Micropolis	MC3391WD	5	\$1899	\$2029
9100MB	11ms	5400	Seagate	ST410800WD	5	\$2129	\$2339

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Ready 9618	150MHz Intel Pentium processor	2.0GB	16MB RAM	\$1,899
Ready 9619	166MHz Intel Pentium processor	2.0GB	16MB RAM	\$2,299

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PowerMate V100e	100MHz Intel Pentium processor	1.2GB/4X	8MB RAM	\$1,425
PowerMate V133e	133MHz Intel Pentium processor	1.2GB/4X	16MB RAM	\$1,649
PowerMate P2200	200MHz Intel Pentium processor	3GB/4X	16MB RAM	\$3,249
*PowerMate Pro 2200	200MHz Pentium® Pro processor	2GB/4X	32MB RAM	\$3,649

* Pro 2200 includes Matrox Video subsystem.

*Monitors not included in price.

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- Removable Lithium Ion Battery
- 16-bit Sound Blaster Audio
- 3-year Limited Return-to-Factory Warranty
- 1 Free Year of UltraCare Service

Model	Processor	Screen	HD/CD-ROM	Price
PC-6200-61703	100MHz Intel Pentium® processor	11.3 SVGA	1GB/4X	\$3,800
PC-6220-61753	133MHz Intel Pentium processor	12.1 SVGA	1.35GB/4X	\$4,900
PC-6220-41803	133MHz Intel Pentium processor	12.1 XGA	1.44GB/4X	\$5,300

The new NEC Versa® 4000 brings you the next generation in notebook versatility with its innovative VersaBay II™ technology. You can configure it at a moment's notice with an optional CD-ROM reader; additional battery or hard drive.

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- Choice of Windows® for Workgroups 3.11 or Microsoft® Windows 95
- 2 PC Card Slots
- VersaSlide™ Pointing Device with Palm Rest
- 3-year Limited Return-to-Factory Warranty
- 1 Free Year of UltraCare Service

Model	Processor	Screen	HD/CD-ROM	Price
PC-6400-71602	100MHz Intel Pentium processor	10.4" Hi-Res TFT	810MB	\$2,900
PC-6410-71702	133MHz Intel Pentium processor	10.4" Hi-Res TFT	1GB/4X	\$3,800

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- Sound Blaster Pro Compatibility

- Choice of Windows® for Workgroups 3.11 or Microsoft® Windows 95
- 1 year UltraCare Warranty

Model	Processor	Screen	HD/CD-ROM	Price
PC-6510-41802	100MHz Intel Pentium processor	810MB	8MB	\$2,250
PC-6510-41702	133MHz Intel Pentium processor	1.06GB/4X	8MB	\$2,000
PC-6550-41703	133MHz Intel Pentium processor	1.06GB/4X	8MB	CALL

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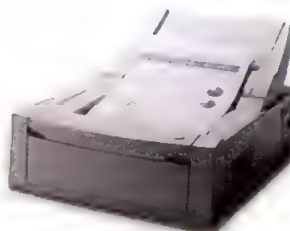
Model	Data Transfer Rate	Type	Access Time	Price
MultSpin IV	900 KB/sec	IDE	145ms	\$ 90
MultSpin 4x4 CD-ROM Changer	300KB/sec	IDE	360ms	\$120
MultSpin 4x4 7 Disc Changer	600 KB/sec	IDE	350ms	\$180
MultSpin IV (Internal)	200 KB/sec	IDE	140ms	\$140
MultSpin IX (Internal)	200 KB/sec	SCSI	140ms	\$340
MultSpin IX (Internal)	1200 KB/sec	SCSI	140ms	\$440



**THE NEC MULTISYNC®
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 \$769***

*Includes \$90 rebate. Must be purchased between August 1 and September 30, 1996.

Model	Screen	DPi	Max Resolution	Price
Multisync C400	14" diagonal CRT	.28mm	1024 x 768 HI	\$ 280
Multisync C500	15" diagonal CRT	.28mm	1024 x 768 HI	\$ 280
Multisync XV15+	15" diagonal flat square CRT	.28mm	1280 x 1024 HI	\$ 480
Multisync M500	15" diagonal CRT	.28 mm	1280 x 1024 HI	\$ 520
Multisync XV17+	17" diagonal flat square CRT	.28mm	1280 x 1024 HI	\$ 760*
Multisync M700	17" diagonal CRT	.28mm	1280 x 1024 HI	\$ 800
Multisync XE21	21" diagonal flat square CRT	.28mm	1024 x 768 HI	\$1,720



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Model	Resolution	TPM	Price
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SuperScript 600	600 dpi	0ppm	\$367
SuperScript C3000	300 dpi Wax Thermal Transfer; Variable Dot Thermal, Dye Sublimation	N/A	\$300

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NEC C500	15 inches	13.8 inches	.28mm	32-10321	\$399 ⁹⁹
NEC XV-15+	15 inches	13.8 inches	.28mm	32-10320	\$499 ⁹⁹
NEC XV-17+	17 inches	15.5 inches	.28mm	32-10319	\$849 ⁹⁹
HITACHI PRO 15	15 inches	13.7 inches	.28mm	32-10309	\$399 ⁹⁹
HITACHI PRO 17	17 inches	15.5 inches	.28mm	32-10310	\$699 ⁹⁹
HITACHI PRO 21	21 inches	20 inches	.28mm	32-10312	\$1799 ⁹⁹
SONY 15SF II	15 inches	13.9 inches	.25mm	32-10302	\$499 ⁹⁹
SONY 17SF II	17 inches	16 inches	.25mm	32-10303	\$799 ⁹⁹
SONY 20SF II	20 inches	19.1 inches	.30mm	32-10304	\$1799 ⁹⁹
US LOGIC 15SVGA	15 inches	13.25 inches	.28mm	32-10265	\$319 ⁹⁹
PIXIE 14SVGA	14 inches	13.25 inches	.28mm	32-10257	\$239 ⁹⁹
PIXIE 15SVGA	15 inches	13.75 inches	.28mm	32-10258	\$319 ⁹⁹
US LOGIC 17SVGA	17 inches	15.75 inches	.28mm	32-10336	\$599 ⁹⁹

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#15-10315	...CHINON	...ESC-3000, DIGITAL STILL CAMERA	...\$849 ⁹⁹
#15-10323	...CONNECTIX	...QUICK CAM FOR WINDOWS®	...\$99 ⁹⁹
#15-10346	...CONNECTIX	...VIDEO PHONE 28.8 FOR WINDOWS®	...\$159 ⁹⁹
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#15-10361	...KODAK	...DC 20 DIGITAL CAMERA	...\$329 ⁹²
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#15-10354	...SONY	...PC CAM VIDEO CAMERA	...\$479 ⁹⁹

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#15-10253	...ANTEC	...TVATOR REMOTE	...\$294 ⁹⁹

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CIRCLE 364 ON READER SERVICE CARD

IDE HARD DRIVES

VENDOR	CAPACITY	ACCESS	SKU	PRICE
Seagate	1.6GB	10ms	19-10380	\$229 ⁹⁹
Western Digital	1.6GB	9ms	19-10366	\$239 ⁹² *
Seagate	2.1GB	10ms	19-10374	\$269 ⁹⁹
Western Digital	2.5GB	10ms	19-10379	\$299 ⁹² *
Western Digital	3.1GB	10ms	19-10388	\$399 ⁹² *
Western Digital	2.1GB	10ms	19-10378	\$269 ⁹² *

*After \$30 Mail-In Rebate

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SIZE	DESCRIPTION	SKU	PRICE
1MB	1 x 9	28-10136	\$19 ⁹⁹ *
4MB	4 x 9	28-10141	\$59 ⁹⁹ *
4MB	1 x 32	28-10421	\$39 ⁹⁹ *
8MB	EDO 2 x 32	28-10510	\$99 ⁹⁹ *
16MB	4 x 32	28-10451	\$169 ⁹⁹ *

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Precision Inst	VESA High speed	20-10157	\$34 ⁹⁹ *
SIIG	EIDE Master ISA	20-10169	\$54 ⁹⁹ *
SIIG	EIDE Master ISA I/O	20-10173	\$69 ⁹⁹ *

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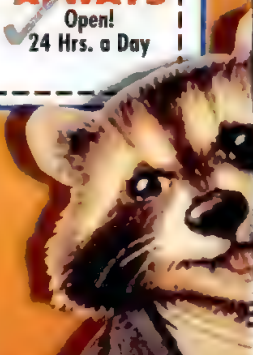
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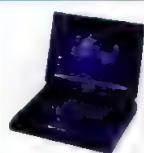
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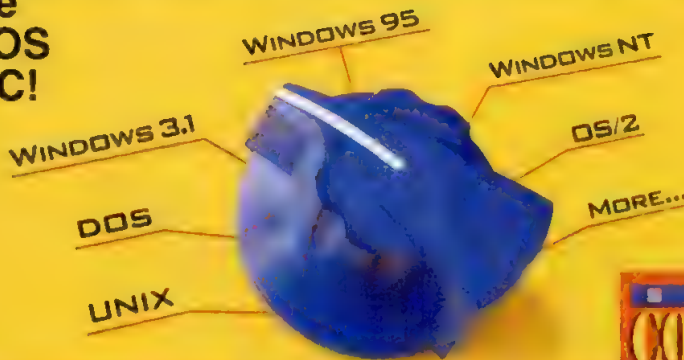
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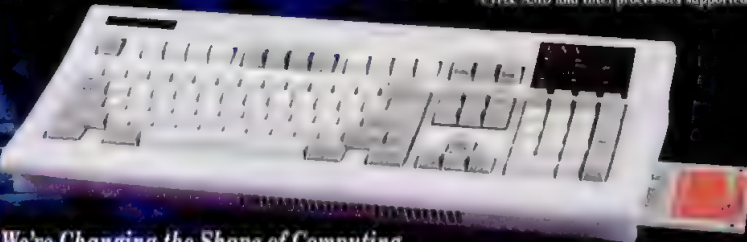
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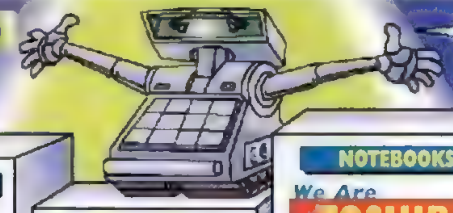
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16 meg 4x32/32	125/109	125/109	129/114	
32 meg 8x32/32	249/232	249/232	255/244	
64 meg 16x32/32	—	—	709/690	
28 Pin	28 Pin	28 Pin	28 Pin	28 Pin
256K (3 chip)	94	94	6	69
1x9-1mb (3 chip)	—	—	16	79
1x9-1mb (3 chip)	—	—	81	94
4x9-1mb (3 chip)	—	—	34	38
4x9-1mb (3 chip)	—	—	43	45

Printer Memory

Model	604	6404	8044	1644	3244
Epson AX 1000, 1500	\$94	168	-	-	-
H-P II, III, IIIx, IIIc	69	115	-	-	-
H-P II ID	69	115	-	-	-
H-P 3S1, 4, 4Mx, 451	-	59	99	198	398
H-P 1800C, DXBXX-750	-	59	99	198	398
H-P 4Mv, 4P, 4+, 4Mv, 4V	39	59	99	198	398
H-P 4Mv, 5Mv, 5P, 5S, Cj	39	59	99	198	398
H-P 4+ (TIMESS)	47	-	-	-	-
H-P CJ 500 Series (256K)	39	-	-	-	-
H-P SL	69	99	169	-	-
Panasonic 4410, 4430	89	169	-	-	-
Panasonic 4480, 4485L	89	169	-	-	-

Notebook Memory

Model	9-4	9-4	9-4	12-0
AST (all models)	94	149	220	
Compaq (most models)	88	148	200	415
IBM (all models)	94	152	227	
HP (all models)	91	146	217	
NEC (all models)	87	145	217	
SBC (most models)	88	148	200	401
NEC (all models)	88	149	205	540
Toshiba (most models)	88	148	218	465
Zenith (most models)	88	140	200	490

Video Memory

	1970	1971	1972
1. 1970	1. 1970	1. 1970	1. 1970
2. 1971	2. 1971	2. 1971	2. 1971
3. 1972	3. 1972	3. 1972	3. 1972

Desktop Memory

	AST Memory			
AST Advantage, Advantage	10	10	10	10
AST Bravo	37	21	110	35
AST Premium UV & 480	41	21		

Compaq Memory

$\mathcal{H}_1$	$\mathcal{H}_2$	$\mathcal{H}_3$	$\mathcal{H}_4$
$\mathcal{H}_1 = \{a, b\}$, $\mathcal{H}_2 = \{a, b\}$	$\mathcal{H}_1 = \{a, b\}$	$\mathcal{H}_2 = \{a, b\}$	$\mathcal{H}_3 = \{a, b\}$
$\mathcal{H}_1 = \{a, b\}$, $\mathcal{H}_2 = \{a, b\}$	$\mathcal{H}_1 = \{a, b\}$	$\mathcal{H}_2 = \{a, b\}$	$\mathcal{H}_3 = \{a, b\}$
$\mathcal{H}_1 = \{a, b\}$, $\mathcal{H}_2 = \{a, b\}$	$\mathcal{H}_1 = \{a, b\}$	$\mathcal{H}_2 = \{a, b\}$	$\mathcal{H}_3 = \{a, b\}$
$\mathcal{H}_1 = \{a, b\}$, $\mathcal{H}_2 = \{a, b\}$	$\mathcal{H}_1 = \{a, b\}$	$\mathcal{H}_2 = \{a, b\}$	$\mathcal{H}_3 = \{a, b\}$

DeN Memory

2. Pb^{2+}	Pb^{2+}	Pb^{2+}	Pb^{2+}
3. Fe^{3+}	Fe^{3+}	Fe^{3+}	Fe^{3+}
4. Mn^{2+}	Mn^{2+}	Mn^{2+}	Mn^{2+}

40	55	17
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IBM PS/1 desktop	49	99	179	309
IBM PS/1 Consultant	49	99	179	369
IBM PS/1 Consultant A	49	99	179	369

ME, XL	(1MEG)	45	—	—
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8008	4	5	6	—
8086	—	—	—	—
8088	—	—	—	—
386/486/586	0	10	11	—
64Kc1	7	8	9	—
64Kc4	7	8	9	—
16Kc4	5	6	7	—

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RAM	29	29
Cache	54	54
Page	115	115
...	...	...

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DJ 340CV	C2064A	\$329	LJ 5N	C3062A	\$1,459	Scanjet 4C	C2276A	IBM AT Comp	\$885
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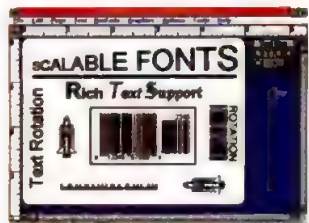
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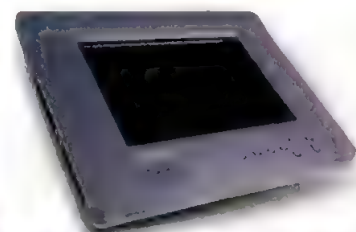
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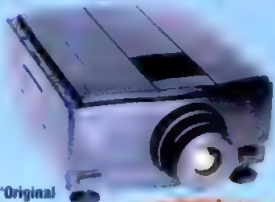
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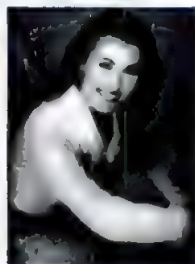
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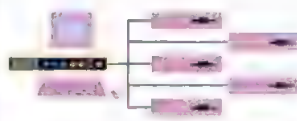
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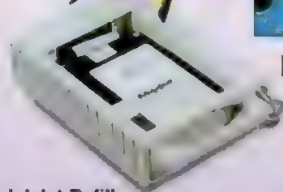
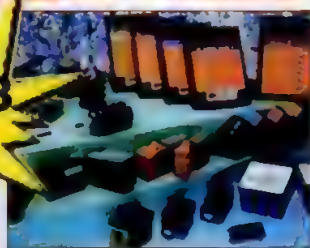
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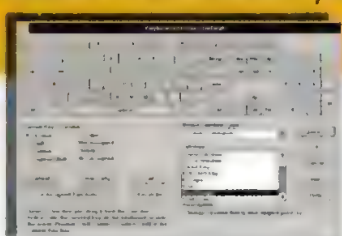
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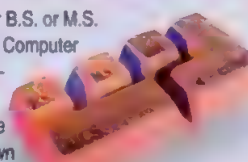
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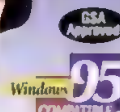
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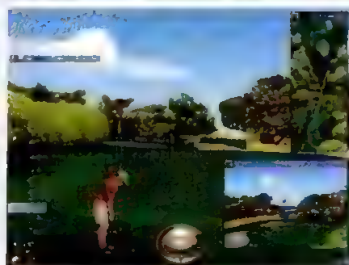
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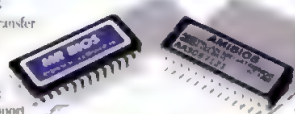
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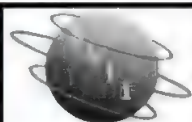


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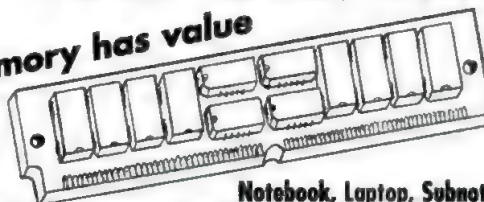
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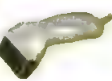
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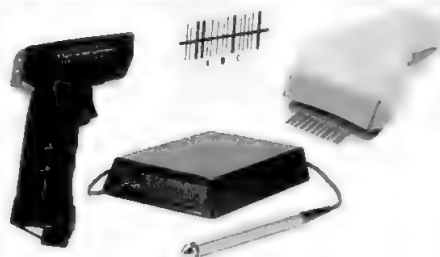


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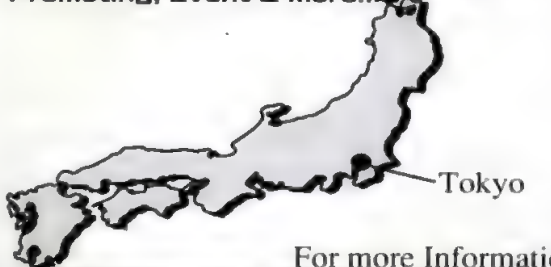
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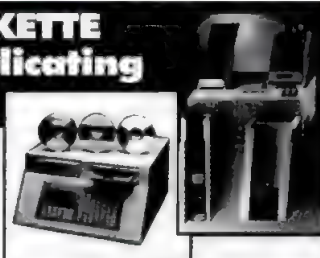
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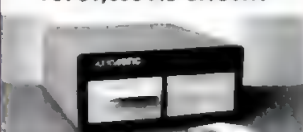
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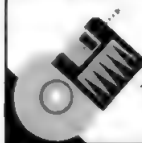
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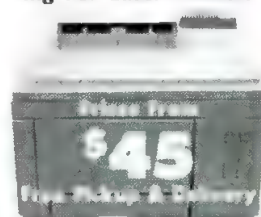
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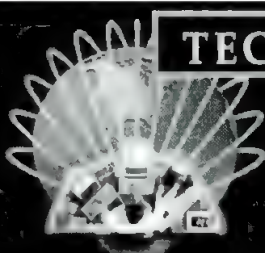
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Quake: The Wait Is Over

The latest effort from id Software is the most eagerly anticipated game ever released. Was it worth the wait? In a word: Yes.

Quake

For nearly two years, action gaming addicts have hungered for Quake, id Software's follow-up to the hugely successful DOOM series. The hype surrounding Quake was almost overwhelming, and gaming aficionados began to question id's ability to deliver as promised. But deliver it did.

Like DOOM, Quake is a DOS-based first-person action game designed to challenge players' ability to move fast and shoot faster. The game is a visual tour de force, albeit a dark and gloomy one. Each of the game's levels (38 in all) is rendered in breathtaking detail, with many impressive features including archways, stained-glass windows, suspended platforms, and even a few full-blown castles. The blood-curdling sound effects and eerie music (courtesy of



attention to detail, even in the game's lower resolutions (the game runs as high as 1,280 by 1,024, but on what system, we can't imagine). The screens you see on this page do not do the game justice: You must see Quake in motion to appreciate the graphics engine and the sense of immersion it provides. Okay, so they went way overboard on the earth tones, but the overall effect is electrifying.

Of course, the game play is the key, and Quake doesn't disappoint in that category. The level designs are challenging

and imaginative, while Quake's bestiary is as impressive as it is frightening. Each of the nasties—from the simple Grunts to the spiderlike Vore and the explosive-proof Shambler—is rendered as a multipolygonal, texture-mapped object, not as a flat bitmap. This means that the monsters move much more realistically than they did in

DOOM and other games such as Duke Nukem 3D. Because of the detail levels and complex creatures, however, you'll need a very powerful system to run at any resolution over 360 by 480 (even our Pentium/166 struggled at 640 by 480).

Does Quake have weapons to please the avid DOOM fan? Oh yes, we're quite certain that fun toys like the perforator will please most players, as will the grenade and rocket launchers. The ultimate weapon, however, is the Thunderbolt, which discharges a beam of electricity at your foes. (Hint: Don't use this last one while standing in water.)

This brings us to the game's true habitat: multiplayer death matches. Simply put, Quake is a very good single-player action game, but it is by far the best, most addictive multiplayer action game we've ever played. Up to 16 players can do battle over IPX or TCP/IP, although TCP/IP performance is pretty bad unless you set up a dedicated Quake server.

We could go on and on about how much we like Quake, but we'll summarize by saying that this game is all it was meant to be and more. If you liked DOOM, we're fairly certain that Quake will blow you away.—Michael E. Ryan



Trent Reznor and Nine Inch Nails) really help set the mood.

As you move through Quake, you'll marvel at the

IN AFTER HOURS

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Win 95 Games: Revolution or Evolution?

We still have yet to see a steady flow of native Windows 95 games, and the ones we do see are a mixed bag indeed.

Microsoft Close Combat

Your armor is ablaze and your bazooka teams are wiped out. Had you reacted faster, your men might still be alive—along with the offensive you're supposed to be leading.

When you play Microsoft's Close Combat, you'll know this feeling on a regular basis. Unfortunately, in this game of real-time tactical combat your reaction time is secondary to the game's processing speed, which is extremely slow.

Close Combat starts you off on D-Day as you and your troops have just hit Omaha Beach. Over a series of battles, you'll lead your troops against German forces as you try to keep the Allied offensive alive. You can also play the German side in the struggle, trying to stem the Allied advance.

The action plays out from overhead, with your tiny animated troops running, crawl-

ing, and shooting their way across the detailed maps. The games' graphic detail is impressive and brimming with well-animated soldiers, vehicles, and explosions. Everything happens in real time so you must scroll around the map giving orders to all of your troops. If you leave them idle for too long, they'll act on their own initiative.

This is not always a good thing, as we regularly saw our 2-man scout parties storming buildings that were packed to the gills with Germans. Also, it's easy to get lost under the barrage of information Close Combat throws your way. We immediately found ourselves longing for the relative simplicity of Command & Conquer.



Finally, the game proceeds at what can only be described as a snail's pace. On a Pentium/166, Close Combat ran at barely tolerable speeds; on a Pentium/90, the experience was painful.—*Michael E. Ryan*

MissionForce: CyberStorm

In the growing sea of first-person giant robot games like MechWarrior 2 and EarthSiege 2, MissionForce: CyberStorm takes a different perspective on the battlefield—literally. MissionForce is a turn-based strategy game in which you command a force of HERCs (Sierra's name for big, killer robots) through a series of battles. This game has more in common with X-COM than it does with real-time games like Command & Conquer and Warcraft II.

The scenario should be familiar to any veteran of the EarthSiege games: humanity is at war with the alien Cybrids, duking it out in huge mechanized robots armed to the teeth. MissionForce allows you to take part in this struggle not as a

pilot, but as a general. You get to purchase and customize your HERCs with weapons and gadgets. Depending on your progress through the game, you will come across new technologies and robot types. You will have to juggle your budget and choose between a variety of missions while maintaining your HERCs and Bionomers (genetically engineered pilots).

The game's SVGA graphics look fabulous—the finely animated HERCs sway as they walk and recoil when hit by missiles.

But MissionForce is not perfect. Despite a helpful online manual (a recent trend in Sierra titles), real printed documentation would have been more useful. And the game design can lead to frustration. For example, even if a HERC has plenty of action points in a given turn, you'll be forced to watch helplessly as kamikaze opponents waltz up to the HERC and detonate.

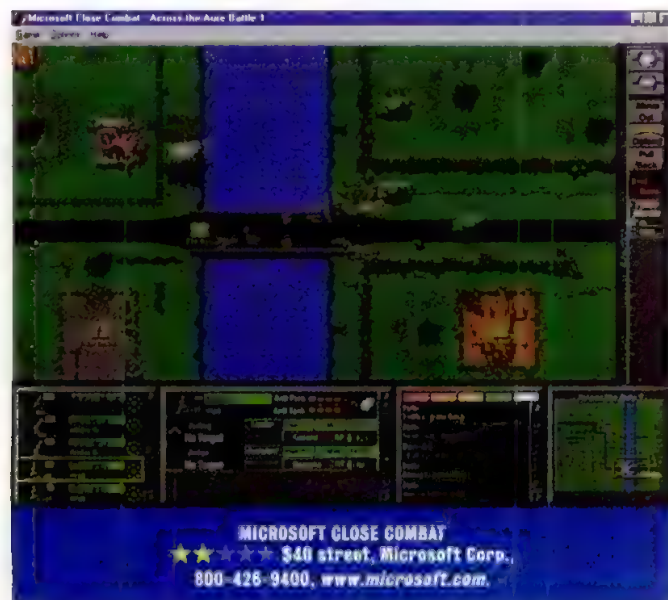
On the positive side, Sierra includes in the package an extra game CD that a friend can use to play you in a head-to-head match over modem or LAN.

MissionForce: CyberStorm is a mouthful to pronounce and a handful to master, but it is fun. And who can get enough of these big ol' robots, anyway?—*Bernard H. Yee*

NHL PowerPlay '96

Virgin's NHL PowerPlay '96 enters a niche dominated by Electronics Arts, whose latest title, NHL 96, is a thing of beauty. Remember the odds against the USA's Olympic hockey team in 1980? Virgin's odds are longer...

Okay, so NHL PowerPlay '96 has a lot going for it. For one thing, it includes a great world tournament mode, where you can lead your favorite country against the rest



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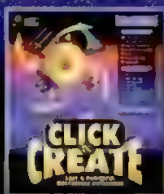
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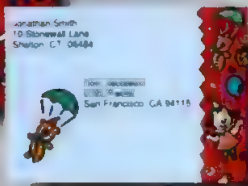


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After Hours

of the world. And the game includes real-world players, such as Pat LaFontaine, Steve Thomas, and Mikko Makela (oh, and some guy named Gretzky, too).

less predetermined than in NHL 96. But it is also a whole lot easier to beat the computer in NHL PowerPlay.

One very welcome twist is the coaching menu, which lets

you select a style of play for your team. For example, you can choose to carry the puck into your opponent's zone or play a dump-and-chase game. NHL 96 does not provide this feature.

But the big drawback here is NHL PowerPlay's paltry array of statistics. Wins and losses are counted, and the stats for your current game are fairly de-

tailed, but you cannot track stats over the course of a season or tournament.

Still, this is a good hockey game. But in a very small market already occupied by an all-star like NHL 96, NHL PowerPlay is a definite minor-leaguer.—MER



The actual game play is very smooth, with your team skating fluidly up and down the one, overhead fixed view of the ice. Despite the chunky low-resolution graphics, the animation is commendable. The flow of the game is fairly realistic and does seem a bit

QUICK CLIPS



Lemmings Paintball

They're back and they're armed with... paint guns. You guide your Lemmings as they try to capture the flag in this entertaining Lemmings sequel. \$49.95 list; Psygnosis; 800-438-7794.



Mortimer and the Riddles of the Medallion

Using the Rebel Assault graphics engine, Mortimer is a fast-paced action game for kids 5 and up. Great animation and a wisecracking snail highlight this one. \$40 street; LucasArts Entertainment Company; 800-985-8227.



Tracer

Best described as cyber-dominos, you use multi-colored tiles to build a safe path through 50 levels of grids, mazes and obstacles in this puzzler. \$30 street; 7th Level; 800-884-8863.



Final DOOM

More carnage for hardcore DOOM fans: This closing chapter includes two new 32-level episodes. A DOOM fix for folks lacking Quake-friendly systems. \$40 street; GT Interactive; 800-610-4847.



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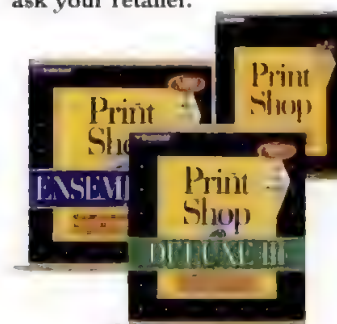
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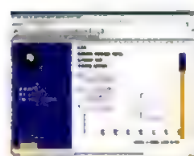
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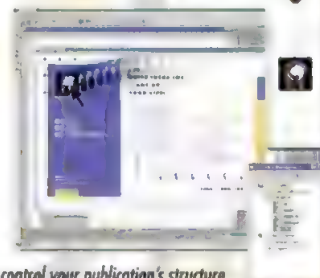


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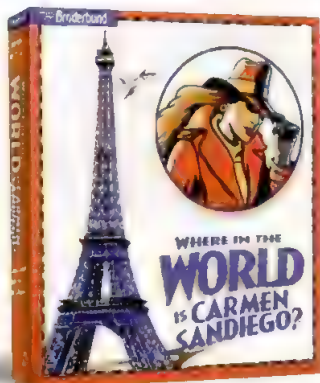


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Microsoft® Excel 5.0 for Windows®	78	88	83	77	79	75	78	68	79	78	75	73
Quattro® Pro 5.0 for Windows® (formerly from Novell Inc.)	77	87	83	76	79	77	78	71	74	75	70	73
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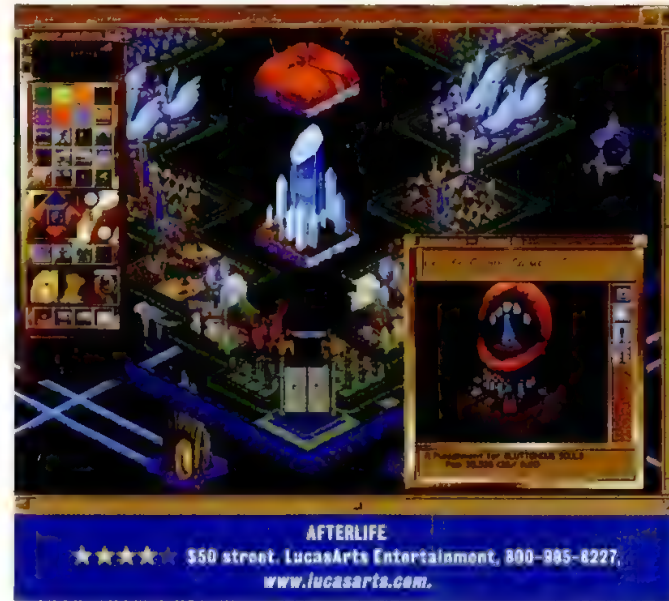
LucasArts' latest title gives the "god" game genre an all-new meaning.

Afterlife

Wanted: Deity with exceptional management skills. Must be tolerant, even-handed, and aesthetically-minded. Experience a plus.

If you think you have the skills to handle a job like this, you're ready to try your hand at Afterlife. You won't be managing some mere city or even a planet in this sim game. Instead, you've got to take the reins of Heaven and Hell and—most importantly—make them profitable.

Once you set up shop in the Hereafter, the place will fill up with SOULs (Stuff Of Unending Life). These come from the planet below, which isn't our Earth but a very similar place which existed a long time ago



you should influence as much as possible.

But first things first. You will need to build structures (a couple of gates, for starters) and zone territory for the incoming SOULs. These zones are set up according to the seven sins (lust, gluttony,



And that isn't the half of it. There are vast numbers of structures and amenities to concern yourself with in order to run things smoothly. If that weren't enough, there are more disasters than you can shake a pitchfork at, Hell In A Handbasket and Heaven Nose among them.

Housing, disasters, trying to turn a profit: Sound like Sim City? Afterlife certainly bears a strong resemblance to the mother of all sims, but it has a few unique touches. The ethereal theme helps, as does the heavy dose of humor. Also, we liked the multimedia help from Demon Wormsworth and Angel Goodhalo, who will offer advice when prompted.

Still, Afterlife is very tough. Earning Pennies From Heaven (the goal of the game) is no small task, even for the intellectually blessed. This is compounded by an utter lack of in-depth documentation.

But in the end, we were won over by Afterlife's challenging game play as well as the title's not-so-subtle humor.—Shane Mooney

in a galaxy far, far away. The influx of SOULs and their corresponding punishments and rewards depend on the belief systems on the planet—which

and the rest) and seven virtues (such as humility and contentment). You have to make sure that you have enough space for each sin and virtue.

Separate the Suds from the Duds

Even beer fanatics can learn a thing or two from this CD-ROM.

Michael Jackson's World Beer Hunter

Pop quiz, hotshot: You're in Central Europe, it's hot, the meal is pike, and you can't afford to get filled up so what beer do you drink? *What beer do you drink?*

Okay, so the pressures of choosing a beer are never that intense. But if you're curious to know the answer to that and many other questions about beers from around the world, pick up Michael Jackson's

World Beer Hunter CD-ROM, from Discovery Channel Multimedia. Thanks to the advent of microbreweries and their phenomenal popularity,

in addition to the newfound accessibility of many foreign beers here in the States, this title will likely carve a nice niche among beer aficionados.

The friendly interface features world maps and videos



which serve to answer questions like "Is beer more sophisticated than wine?" (which is a silly question—of course it is). It also allows the users to

take individualized tours based on their interests.

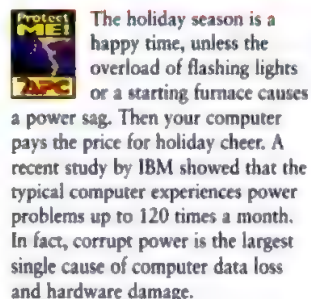
One of our favorites, the Pub Crawl tour, allows you to see the world through the bottom of a glass (although in real life, this much drinking might

cause severe physical harm).

World Beer Hunter also offers a direct connection to Michael Jackson's Beer Hunter Web site (www.beer-hunter.com) and it allows the user to maintain a personalized list of beers, complete with a helpful rating system. With over 300 individual beers detailed on the CD, users will have their hands full trying to get a taste of each one.

But best of all, after playing with this CD, people who once considered themselves mere beer drinkers can now think of themselves as connoisseurs.—William P. Flanagan

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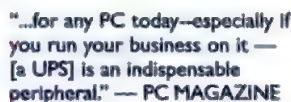
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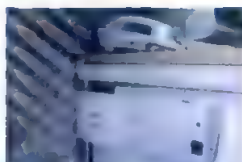
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of workstations on site/sold per month: _____ Brand of UPS currently used/sold: _____

AF **Micro Center** is giving away a chance to win a shopping spree at a participating store listed below.

Prizes:

First: \$2,000

Second: \$1,000

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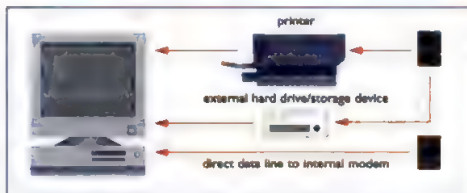
Over 6,000,000 satisfied customers insist "Protect ME! with APC".



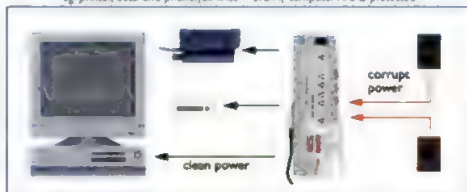
Steve Richbourg
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"I just got my first Back-UPS Office. I've purchased seven since because people keep stopping by my desk and saying they want it! Recommending power protection is what I do for a living, and I've never had an upset customer in more than four years recommending APC."

Multipath™ Means Total Power Protection



Bad power (red) can enter a computer system through multiple paths: eg. printer, data and phone/fax lines – even if computer A/C is protected



The Multipath™ protection of Back-UPS Office™ shields your peripherals and guards your computer from bad power on every path, providing clean, safe power (green), to your entire system.

Back-UPS Office award-winning features:

Integrates the Security of a Surge Suppressor with the Power of a UPS

Six outlets guard your hardware with full-time surge protection. Three of the six outlets provide instantaneous battery backup to keep your system from crashing in the event of brownout or blackout.

Internet Ready Fax/ Modem Protection

Back-UPS Office's built-in phone line/10 Base-T network cable surge protection prevents surges from damaging internal & external modems, motherboards, 10 Base-T lines, input/output cards, and other system components.



Convenient BlockSafe™ Outlet Spacing

Back-UPS Office's outlets are spaced to accommodate all size plugs, including large transformer blocks.

Master On/Off Switch

One switch conveniently controls power to entire connected system.

Electrical Wiring Fault Indicator Saves Trouble and Expense

Without a proper ground, most surge protection is useless. Back-UPS Office alerts you to wiring problems such as a missing ground and reversed polarity, two common miswirings which otherwise would require an electrician's visit to diagnose.

Circuit Breaker

Provides protection in the event of an overload or short circuit; no fuse, no hassle.

Check Battery Warning Prevents Downtime Before it Occurs

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\$25,000 Equipment Protection Policy

If your properly connected equipment is ever damaged by an AC surge, including surges due to lightning, APC will repair or replace our product and up to \$25,000 of connected equipment for as long as you own your Back-UPS Office. (See policy for details.)

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Back-UPS Office has user replaceable batteries that can be easily swapped out, saving time and expense: no need to return the UPS to the factory for service. Batteries last 3-6 years under normal usage.

2 Year Warranty

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BACK-UPS PRO ADVANCED PC PROTECTION: For Pentium, 486, Win 95, and Business Applications

Volt-Amp Rating	List Price	Runtime*
280PNP	\$199	6 min.
420PNP	\$339	8 min.
650PNP	\$419	17 min.
1000 ^{PS}	\$589	35 min.
1400 ^{PS}	\$759	74 min.

• For Multipath™ PC and peripheral protection, choose new Back-UPS Office, featuring 6 outlets with guaranteed surge protection, 3 of which provide instantaneous battery backup, fax/modem protection, and BlockSafe™ outlet spacing for the accommodation of all size plugs and transformer blocks.



BACK-UPS OFFICE MULTIPATH™ PROTECTION: For 386, Entertainment, education & all peripherals

Volt-Amp Rating	List Price	Runtime
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BACK-UPS BASIC PC PROTECTION: For 286, 386, Entertainment, and education

Volt-Amp Rating	List Price	Runtime*
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400	\$199	13 min.
450	\$254	24 min.
600	\$359	31 min.
900	\$529	47 min.
1250	\$689	75 min.

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• For Datacenter protection, ask about our Matrix-UPS line (not shown).

• For hardware-only surge protection, ask for APC's SurgeArrest™ line (not shown).

*Runtime shown is for typical Pentium desktop system and may vary with your actual load.

Note: Back-UPS 200 not recommended for Pentium systems

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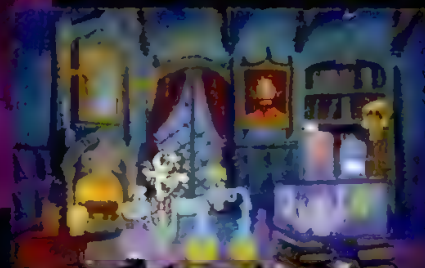
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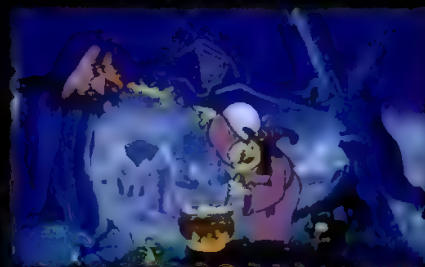
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Introducing the new Utopia XP400 extreme performance 17-inch Diamondtron color monitor.

The XP400 features the acclaimed DiamondTron picture tube with 16.18" diagonal viewable size aperture grill design and an ultra fine pitch of 0.25 mm, making it capable of displaying the largest and sharpest of pictures with the brightest of colors to be found anywhere. Its ultra wide 135 MHz bandwidth and horizontal frequency range of 24 to 82 kHz enables it to easily handle the maximum resolution of 1600 x 1200 at 60 Hz, or the recommended resolution of 1280 x 1024 at a flicker-free 75 Hz. The XP400 also features a one-button flywheel digital control coupled to an advanced on-screen display to allow you precise adjustments of everything from screen geometry to RGB hues.

Best of all, the Utopia XP400 is available at the estimated street price of \$769, including a 3-year limited warranty.

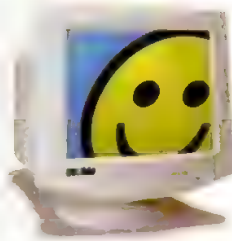
Utopia also offers the EV400 17-inch FST color monitor, with a maximum resolution of 1280 x 1024, which represents excellent value at the estimated street price of \$549.

For more information, please call:

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XP400 Estimated Street Price \$769



EV400 Estimated Street Price \$549

Manufacturer & Model	Utopia XP400	ViewSonic PT770	MAG DX700T	Utopia EV400	MAG DX1795
CRT	DiamondTron	DiamondTron	Trinitron	FST	FST
Viewable Diagonal Size	16.18"	16.18"	16"	15.8"	15.8"
Dot Pitch (mm)	.25*	.25*	.25*	.28	.26
H. Freq. Range (kHz)	24-82	24-82	30-68	30-68	30-65
Max Resolution	1600 x 1280	1600 x 1280	1280 x 1024	1280 x 1024	1280 x 1024
Estimated Street Price	\$769	\$849	\$799	\$549	\$699

* Aperture grill

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Color Printers

Color documents are becoming a must in the corporate environment. Presentations and reports make more of an impact in color, and graphic arts professionals need to produce good-looking color comps affordably. We look at a range of color business printers—from lasers to ink jets to thermal dye transfer units—that deliver image quality and speed to suit every department.

Application Servers

If you think that equipping your LAN with a new enterprise-class application server involves spending \$100,000 or more for a Unix-based solution, think again. After months of design and development delays, quad-processor Pentium Pro-based application servers have finally arrived. These machines have the power to service your clients with clock cycles to spare, and they have many of the redundancy and fault-tolerant features hitherto found only in more expensive, often proprietary solutions. PC Labs tests eight enterprise-class application servers under Windows NT Server 3.51 using our benchmark test suite ServerBench 3.1.

Multiplayer Gaming

Games are social events, so if you're still playing Duke Nukem 3D against the computer, you're missing out on the real fun. We look at four different online gaming services that allow you to connect with fellow game addicts over modem and Internet links. We also look at some of today's most popular multiplayer games and their effect on local area networks.

PC Tech: Java Speed Trials

What's the best browser for running Java applets? Which vendor has the fastest just-in-time (JIT) Java compiler? *PC Magazine* launches its new Java performance tests, which provide a detailed look at the efficiency of the leading Java-enabled browsers, JITs, and development tools.

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420	TeleMagic Professional 2.0	TeleMagic Inc.	74
490	TeleVox	Voxware Inc.	119
427	TotalWeb 1.0	Quarterdeck Corp.	78
963	Turboways 25 ATM PCI Adapter	IBM Corp.	NE17
494	VDOPhone Internet	VDOnet Corp.	148
431	ViewSonic P815	ViewSonic Corp.	78
479	ViewSonic PT770	ViewSonic Corp.	279
479	ViewSonic 17EA	ViewSonic Corp.	279
958	Virtual TCP Online	InfoExpress	NE37
453	VisionMaster Pro 17	Iiyama North America Inc.	258
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959	WavePoint II	Lucent Technologies	NE38
491	WebPhone 2.0	NetSpeak Corp.	120
951	Wildcat! 5.0	Mustang Software Inc.	NE29
480	WYSEvision WY-17PS	WYSE Technology Inc.	279
481	Z-Vision ZCM-1750-UT	Zenith Data Systems	279

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Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott

Oops! Spilled My Coffee!

Faithful reader and computer salesperson Janet Campbell got a call from a customer who explained that his PC's retractable cup holder was broken and needed repair. Cup holder? Janet was confused until she realized that the customer was talking about his CD-ROM drive.

ARF on 
the Road:
Maul, Hawaii



Very Confusing? Too True

"Every computer deals with the hardware handshake signals in a different way even software handshake is used, and if the hardware signals are not asserted, software handshake users may not be able to send files which is very confusing sometimes."—EX/NET SERVER DOCUMENTATION



Geez, Jimmy. 
If you think it's
fun now, just wait
till you turn it on!
(Spiegel Modern
Classics catalog.)

Uh, Never Mind, I Think I'll Fix It Myself

"Not responsible for physical damage and misuse. All checks must be accompanied by a major credit card and driver license. Repair or replacement of defective products is a B. Computer's desecration."—B. COMPUTER CONSULTING INTERNATIONAL AD



 What the heck. Another Macintosh slam, the second one on this page. Heh heh. (*The Idaho Statesman.*)



"I asked for software that would biodegrade after it was thrown out, not while it was running."

If your entry is used, we'll send you \$50 and a PC Magazine T-shirt. Send your entries to Abort, Retry, Fail?, PC Magazine, One Park Ave., New York, NY 10016-5802 or via e-mail (text items only) to don_willmott@zd.com. Winners this issue: Rob Buechner, Janet L. Campbell, Carl Freedman, E. David Kipping, Charles McCall, and Gerardo Mendoza.

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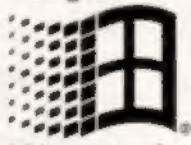
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